

NETWORK WORLD

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FCC adopts revised LEC price caps

By Anita Taff
Washington Bureau Chief

WASHINGTON, D.C. — Despite user, vendor and congressional protest, the FCC last week voted to implement price caps for local carriers on Jan. 1.

The Federal Communications Commission said the plan could save consumers as much as \$2.5 billion on local carrier interstate access and operator services during the next four years. That figure is more than triple the savings projected by the FCC in 1987 when the plan was introduced.

The commission said the increased savings are due to modifications made to the plan to ensure that users benefit from the new regulatory plan.

Users and long-distance carriers that had voiced grave concerns about the FCC's earlier price cap proposal reacted cautiously to the decision, saying they need to review the changes to assess the effect on customers.

The FCC ordered the eight largest local carriers — the seven regional Bell holding companies and the GTE Telephone Operating Group — to convert to price cap regulation next year. The plan will be in effect for four years, during which time any other local carrier may elect to convert from rate of return to price caps.

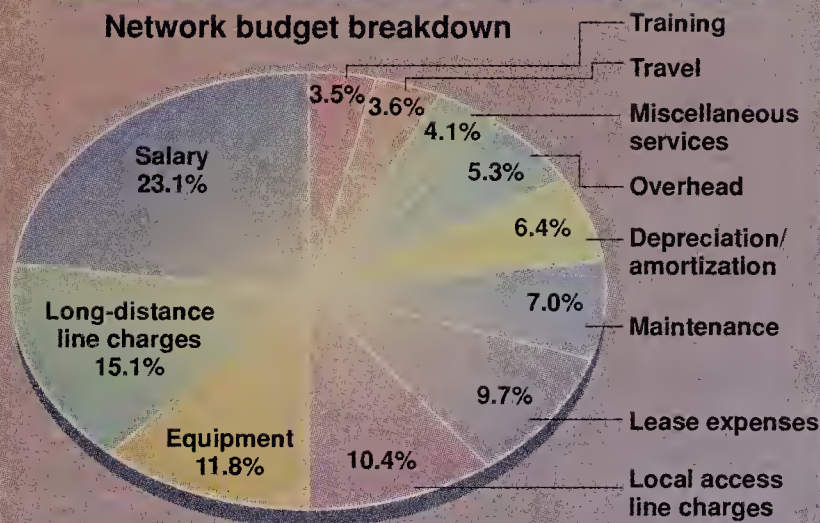
In 1994, the FCC must determine if the plan is working.
(continued on page 94)

FEATURE

Where the network dollars go

Average company statistics
Network budget: \$9.2 million Employees: 27,300
Annual revenue: \$5.7 billion Number of U.S. sites: 296

Network budget breakdown



GRAPHIC BY SUSAN SLATER

SOURCE: NETWORK WORLD AND TFS, INC., WESTFORD, MASS.

Survey: Chargebacks, cost controls drop '91 budgets

By Salvatore Salamone
Features Writer

Deepening fears of recession and dire economic forecasts may have already made an impact on next year's telecommunications budgets, according to the 1990 *Network World* budget survey.

After seeing years of steady growth, network managers expect 1991 budgets to decline by about half of one percentage point from this year's figures. Communications budgets for 1990 averaged \$9.2 million, up 8% from 1989.

The findings were based on re-

sponses from 558 communications managers (see "Survey methodology," page 52). Those surveyed provide communications services and support for firms with an average annual revenue of \$5.7 billion (with a survey median of \$1.2 billion) and about 27,300 employees in the U.S.

Much of the overall reduction can be traced to expanded user cost-control programs, including internal chargeback systems, and to reallocation of communications funds.
(continued on page 49)

IBM widens support for OSI within SAA

Adds support for OSI traffic over LAN links, offers OSI software for micros, minis; unveils X.400 pack.

By Paul Desmond
Senior Editor

NEW YORK — IBM last week announced a new OS/2 version of its OSI Communications Subsystem and upgraded the mainframe version so it can use local networks to communicate with other OSI-based processors.

In addition, the company promised to introduce a version of the OSI software for the Application System/400 minicomputer by the third quarter of 1991. That means everything from IBM mainframes and AS/400 minicomputers to Personal System/2 microcomputers will be able to participate in OSI networks.

IBM also announced new and enhanced OSI applications that work with the subsystem, including its strategic X.400 electronic messaging product for MVS and VM, and promised to deliver a version of the product for OS/2 and OS/400.

"IBM is making a tremendous standards push, and anybody who doesn't realize that has got to be living in a vacuum," said Frank Dzubeck, president of Communications Network Architects, Inc., a Washington, D.C. consultancy.

The new release of the OSI/Communications Subsystem for MVS and VM, Release 1 Modification Level 1, lets the subsystem

support International Standards Organization (ISO) 802.3 Ethernet local-area networks.

That means OSI applications supported by the subsystem on IBM mainframes will be able to communicate with other Ethernet-attached OSI-based mainframes.
(continued on page 8)

RBHC ISDN customer base

RBHC	ISDN customers	ISDN lines installed
Ameritech	50	36,000
Bell Atlantic Corp.	25-30	4,500
BellSouth Corp.	25-30	1,500 - 1,800
Nynex Corp.	7	12,000
Pacific Telesis Group	15	1,400
Southwestern Bell Corp.	20	23,000
US West, Inc.	35	12,000

GRAPHIC BY SUSAN J. CHAMPENY

RBHCs take user-by-user tack on ISDN

By Bob Wallace
Senior Editor

Unsure of user demand and wary of stranding investment in switches and software, the regional Bell holding companies have taken to offering Integrated Services Digital Networks on a customer-by-customer basis, instead of deploying ISDN on a broad scale.

Of the RBHCs' 200 current ISDN customers representing some 80,000 installed lines, only a dozen pay tariffed prices for ISDN. The rest have signed customer-specific proposals.

As a result of this strategy, ISDN deployment, which began in 1985, has been slow. Today, less than 5% of RBHC central office switches and less than 1% of all access lines are ISDN-ready.
(continued on page 96)

NETLINE

NCR UNVEILS a powerful line of scalable servers based on industry standards. Page 2.

MCI FILES PRI tariff, plans to roll out service with options at TCA show. Page 2.

XEROX UNWRAPS LAN-based software with common graphical user interface. Page 2.

CABLETRON OFFERS SNMP-based net management system to monitor and control other vendors' gear. Page 4.

AS THE FORCE behind PREP-net, Gary Augustson is a Network Innovator. Page 98.

Fractional T-1 services drive hardware market

By Daniel Briere
Contributing Editor

Increasing user interest in fractional T-1 services is providing a healthy boost to the otherwise moribund customer premises switch market. The fractional T-1 market has vendors scrambling to offer multiplexers, channel service units (CSU), data service units (DSU) and other hardware.



In this Buyer's Guide, *Network World* examines fractional T-1 equipment — and the services that make this equipment necessary — and offers guidelines for choosing fractional T-1 multiplexers and DSU/CSUs. Fractional T-1 products serve user needs in different ways, and each offers its own benefits.

Interestingly, it is the low-priced products that are the most popular.
(continued on page 55)

NCR unveils scalable server line based on standards

System 3000 servers support parallel processing; high-end units offer mainframe class performance.

By Bob Brown
Senior Editor

NEW YORK — NCR Corp. last week unveiled a powerful line of scalable servers based on industry standards, including high-end superserver models that support parallel processing and offer mainframe-class performance.

NCR's introduction of its System 3000 line, based on industry-standard operating systems, will enable users to port applications across different servers and facilitate networking, analysts said.

The company's new servers are based on multiprocessor designs supporting from one to 4,000 processors and offering 7.5 million instructions per sec-

ond (MIPS) to more than 100,000 MIPS.

NCR said the servers are designed for compute-intensive applications, including transaction processing and data base manipulation.

The System 3000 line consists of seven classes of computers, including laptops, workstations, servers and superservers. The products are based on Intel Corp.'s 80486 and 80386 microprocessors and support AT&T's Unix System V.4, Santa Cruz Operations, Inc.'s SCO Unix, OS/2 and DOS.

In two separate announcements scheduled for next month, *(continued on page 99)*

MCI set to announce ISDN PRI service at TCA show

Carrier files outline of pricing, features with FCC.

By Bob Wallace
Senior Editor

WASHINGTON, D.C. — MCI Communications Corp. last week filed an ISDN Primary Rate Interface (PRI) tariff with the Federal Communications Commission, making it the last of the big three long-distance carriers to offer the service.

MCI is expected to formally announce Integrated Services Digital Network PRI and two optional PRI features at the Telecommunications Association, Inc. conference this week in San Diego.

In its filing, MCI outlined pricing for PRI, automatic number identification (ANI) and Call-by-

Call Service Configuration features. MCI's PRI service, which can be used to access the carrier's MCI 800 Service, Vnet and Prism 1 offerings, has a \$3,000 onetime installation charge and a \$400 monthly fee.

MCI will offer PRI beginning Oct. 1 on a controlled introduction basis with a limited number of customers. Sources close to the carrier say 12 customers are currently beta-testing the offering. MCI would not provide additional details on PRI availability.

"MCI customers have been waiting for PRI for quite some time," said Charles Nichols, vice-president at the Boston office *(continued on page 95)*

Graphical user interface key feature of Xerox pack

By Tom Smith
New Products Editor

PALO ALTO, Calif. — Xerox Corp. last week introduced client/server software for local-area network environments that provides a platform with a common graphical user interface for Xerox's and other vendors' groupware products.

GlobalView, designed for use in Ethernets supporting Unix and DOS client workstations, comes with a set of basic applications, such as electronic mail, and enables users to move from one machine to another in the network and get the same interface and net services to which they're ac-

customed.

In addition, GlobalView supports advanced applications such as Xerox's DocuTeam, document management groupware for creating, accessing and revising files as part of a group project.

In the initial release of GlobalView, the server component of the client/server software will only run on Xerox's proprietary Xerox 8090 server, a minicomputer that supports the Xerox Network Systems protocol.

By mid-1991, Xerox plans to port the server software to run on Unix and DOS computers.

The client software runs on ei- *(continued on page 95)*

Briefs

Wellfleet to bolster SNMP software.

Wellfleet Communications, Inc. today is scheduled to announce a new release of its Simple Network Management Protocol (SNMP) software that can monitor and control devices from multiple third-party vendors supporting SNMP agents. Release 2.0 of Wellfleet's SNMP-NMS, which runs on a workstation from Sun Microsystems, Inc., will support routers, local-area network hubs, gateways and terminal servers from vendors including Advanced Computer Communications, Novell, Inc., SynOptics Communications, Inc. and Xylogics, Inc. The software, which is available now, costs \$15,000. Current users can receive a free upgrade.

IBM adds TCP/IP for MVS hosts.

IBM last week fulfilled a June statement of direction by announcing IBM TCP/IP Version 2 for MVS, which lets MVS mainframes communicate with other computers on a Transmission Control Protocol/Internet Protocol network.

Chief among the enhancements is support for the Simple Network Management Protocol, which means an MVS version of NetView can act as the focal point for managing both TCP/IP and Systems Network Architecture nets or it can be managed by another SNMP manager.

The product also lets TCP/IP users submit jobs to an MVS mainframe via the TCP/IP File Transfer Protocol. In addition, it will support the 100M bit/sec Fiber Distributed Data Interface offered on the IBM 3172 Interconnect Controller.

IBM TCP/IP Version 2 for MVS will be available in June 1991. Its basic onetime charge ranges from \$19,360 to \$66,840.

Emery, AT&T forge EDI link.

Emery Worldwide and AT&T last week agreed to exchange invoices and remittance data via electronic data interchange (EDI). The program will eventually eliminate paper invoices and remittances for more than 5,000 shipments that Emery handles for AT&T each month, resulting in significant savings for both firms.

Emery's billing system will incorporate an EDI invoicing standard for the air freight industry known as Set 110. Transactions will be delivered by AT&T's EDI Network, a commercial value-added network service.

Explosion halts global net. An explosion in a local power station last week stopped service on Telerate, Inc.'s global market data and news network for 2½ hours.

Telerate's main data center, in Jersey City, N.J., was shut down from about 7:15 a.m. to 9:50 a.m. last Tuesday due to an interruption in electrical service. According to a company spokesman, backup batteries kept computers from crashing immediately and losing data. But he said Telerate was in the process of installing diesel power generation systems and wasn't able to use them once batteries ran out of juice. The outage did not affect Telerate's Trading Service for foreign currency trading.

AT&T nabs Mexican pact.

Telefonos de Mexico S.A. de C.V., Mexico's national telephone company, last week awarded AT&T a \$130 million contract to build the largest part of a fiber-optic net that will link 54 locations throughout the country.

AT&T outbid two of Mexico's largest traditional suppliers, L.M. Ericsson of Sweden and Alcatel N.V. of France, for the right to build 60% of the network. Alcatel will build 25% of the net, while Ericsson will build the other 15%.

The project, which involves installation of 8,000 miles of fiber cable and related equipment, begins this month and should be completed by 1993.

Mainframes meet LANs.

Data base vendor Sybase, Inc. in Emeryville, Calif., last week introduced a new line of software that enables local-area network users to integrate IBM MVS mainframes into client/server environments. Sybase Open Server for CICS lets users access data, services and applications residing on an MVS mainframe.

Sybase President and Chief Executive Officer Mark Hoffman said the new offerings — due to ship in the fourth quarter of this year — are the first products that enable LAN users to integrate existing server-based applications with IBM MVS applications and services. The offerings cost from \$75,000 to \$155,000.

Sybase also announced its Sybase Open Gateway for DB2, which offers users all the capabilities of its Open Server for CICS software in addition to incorporating an SQL gateway that provides access to DB2 data bases. That product costs from \$100,000 to \$200,000, depending on the class of machine.

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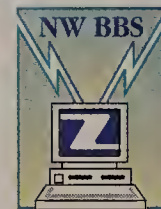
Networking

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Cabletron introduces SNMP-based integrated net management system

By Tom Smith
New Products Editor

ROCHESTER, N.H. — Cabletron Systems, Inc. last week introduced a Simple Network Management Protocol (SNMP)-based integrated net management system that can monitor and control devices from Cabletron and more than 30 other vendors that support SNMP.

Cabletron's Spectrum software, which runs on Unix processors, uses artificial intelligence techniques to correlate multiple alarms from network devices to pinpoint

the cause of a net problem.

Spectrum manages a variety of devices in large local-area network environments either on a stand-alone basis or through integration with enterprise management systems such as IBM's NetView, for which Cabletron is developing an interface.

Because Cabletron will support the Common Management Information Protocol (CMIP) defined under Open Systems Interconnection standards, Spectrum could eventually be used as an enterprise management system, said Chris Oliver,

Cabletron's director of engineering.

Spectrum is based on a client/server architecture. The server component runs on a variety of Unix platforms including workstations from Digital Equipment Corp., IBM and Sun Microsystems, Inc.

The server can communicate with as many as 20 Unix-based clients, from which net managers view network statistics and perform net control functions. The user interface is based on the Open Software Foundation's Motif graphical user interface and supports the X/Window System.

Net managers can request and display the value of SNMP variables. They can also take corrective actions in response to alarms generated by SNMP agents in the devices being managed.

The Unix server, which Cabletron refers

to as the Virtual Network Machine (VNM), runs multiple components. One, known as a Management Module, is required for each managed device. It serves as the interface to the device, defining device characteristics, as well as the alarms, alerts and statistics it will provide.

Cabletron currently has Management Modules for LAN hubs and file servers, bridges, routers, terminal servers, workstations and minicomputers. The modules support equipment from 33 vendors including Banyan Systems, Inc., Cisco Systems, Inc., Digital Equipment Corp., Hewlett-Packard Co., Hughes LAN Systems, SynOptics Communications, Inc., 3Com Corp. and Xyplex, Inc.

The Management Module works with
(continued on page 94)

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Proteon to offer first RISC-based bridge/router

By Laura DiDio
Senior Editor

SAN JOSE, Calif. — Proteon, Inc. will unveil the industry's first Reduced Instruction Set Computing (RISC)-based inter-networking bridge/router at next month's INTEROP 90 Conference and Exhibition here, company President Patrick Courtin told *Network World* last week.

The bridging router, code-named "XP" for experimental prototype, is scheduled to ship within the next six months. Proteon is already delivering it in quantity to an unnamed federal agency, Courtin said. Proteon will demonstrate the XP in a working network at INTEROP.

The XP is a stand-alone device based on the Advanced Micro Devices, Inc. 29K-byte RISC processor chipset.

It runs software, in development at Proteon during the last 18 months, that is optimized for the high-throughput RISC-based architecture. The device will support the IEEE 802.5 source routing specification, which enables it to map the optimal path for transmitting data between Ethernet and token-ring local-area networks.

Courtin declined to divulge the number of LANs the new RISC router will support.

The XP will be capable of routing 64K-byte packets at 20,000 packet/sec between 10M bit/sec Ethernets and 4M and 16M bit/sec token-ring nets, Courtin claimed. According to Gary Wood, Proteon's senior internetworking product manager, that's twice the speed of current-generation products.

"We're looking at a cost-effective price/performance ratio. The new RISC router will be priced at \$12,000 to \$20,000, depending on configuration," Courtin said.

The router supports all major standard and proprietary internetworking protocols including Transmission Control Protocol/Internet Protocol, Novell, Inc.'s Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX), Open Systems Interconnection, Xerox Corp.'s Xerox Network Systems, Apple Computer, Inc.'s AppleTalk and Digital Equipment Corp.'s DECnet.

Bill Redman, director of LAN communications services at Gartner Group, Inc. in Stamford, Conn., praised Proteon for its
(continued on page 6)

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Int'l users caution against one-stop shopping deals

By Barton Crockett
Senior Editor

ARLINGTON, Va. — One-stop shopping arrangements designed to simplify the management of international private lines can backfire and require more customer contact with each carrier involved, according to users at a conference on international communications here last week.

In an opening speech at the TeleStrategies, Inc. conference, Ron Bell, head of group telecommunications at The British Petroleum Co. PLC, said his experiences with a British Telecommunications PLC circuit leased through a one-stop shopping deal had soured his enthusiasm for the offerings.

"We had a really bad time," said Bell, who also serves as president of the Telecommunications Managers Association, a user group in England. "I think we'd need to see several things change before we'd go back [and use the service again]."

That sentiment was echoed by Achin Dasgupta, vice-president for international telecommunications at Shearson Lehman Brothers, Inc. in New York. Dasgupta said coordination problems between AT&T and British Telecom in a one-stop shopping deal made it more difficult to install private lines between the U.S. and the U.K.

"I tried it twice and failed [both times]," Dasgupta said.

Trouble in Belgium

Bell's troubles involved a 2M bit/sec digital E-1 link used to support videoconferences between London and Brussels, Belgium.

He said British Telecom had agreed to be the principle contact with the Belgium carrier, Regie des Telegraphes et des Telephones (RTT).

The initial installation went fine. Things even went smoothly when British Petroleum asked British Telecom to fix a subsequent outage. The repairs were made within two to three days.

Later, however, RTT decided to take British Petroleum's circuit down to investigate the cause of the earlier outage and failed to inform either British Telecom or British Petroleum.

Bell said it took several days to identify the source of the second outage and said it could have been avoided or shortened if British Petroleum had worked directly with RTT rather than going through British Telecom.

Bell said the experience has lessened his enthusiasm for one-stop shopping and he doesn't anticipate using the arrangement again. He advised other users against the strategy, unless carriers in different countries can co-

operate better.

Bell said he doubts, however, that this can happen, particularly in Europe, where carriers will be increasingly competitive with one another for business in the

emerging Common Market of 1992. "I have my doubts that this will ever work," he said.

Some successes

To be fair, Dasgupta and other users said that some one-stop shopping and international outsourcing arrangements can work. For example, Dasgupta said Shearson Lehman has had success using foreign carriers to

house and maintain network equipment supporting Shearson Lehman's international net.

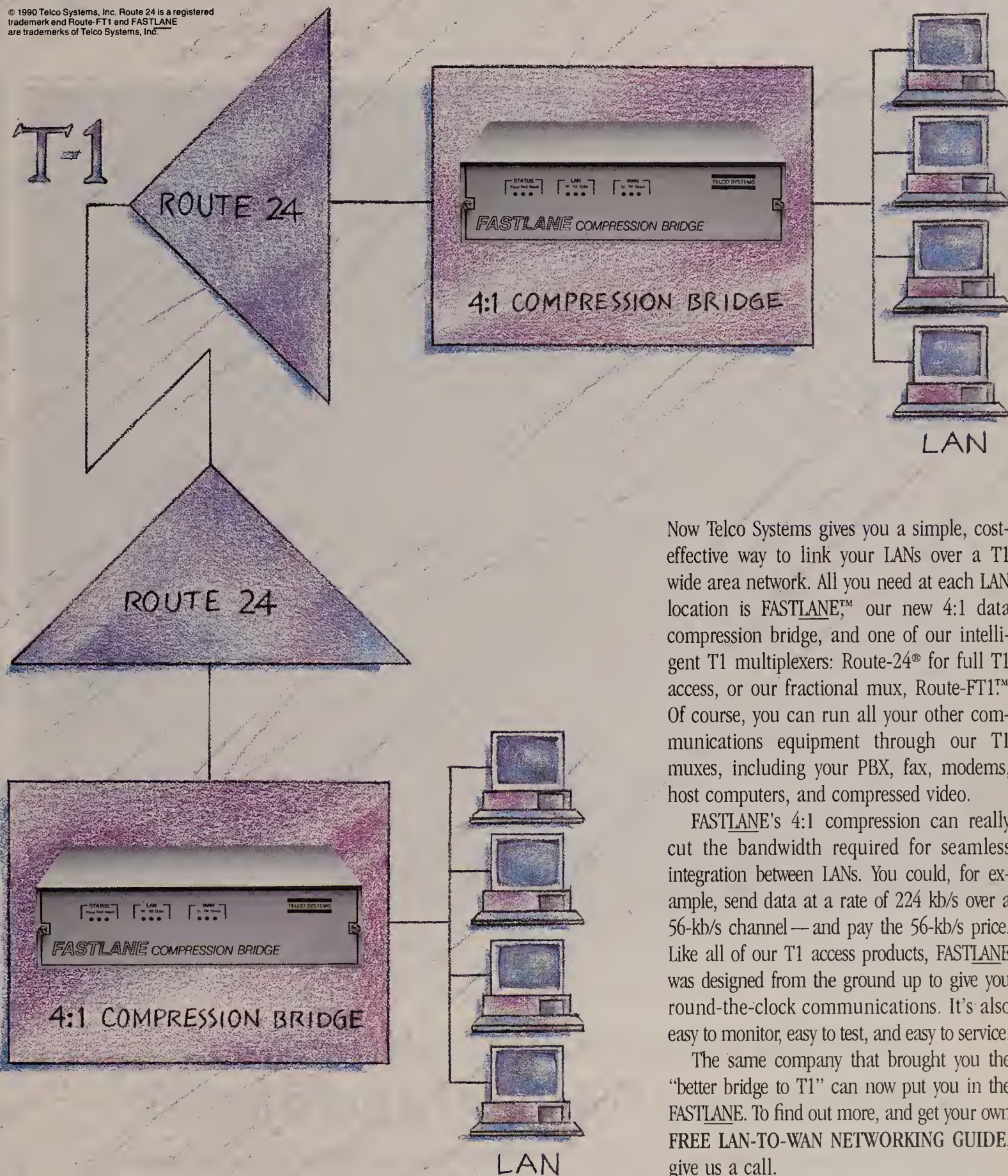
Several conference attendees added that international value-added network service providers can offer effective one-stop shopping service since international coordination issues have already been worked out.

But when it comes to installing and maintaining international

private lines, most observers said the best tack is for users to handle the job themselves.

One-stop shopping is "something that probably won't work," said Ken Zita, an independent consultant in New York and one of the conference's organizers. "And it contradicts the whole reason for going with a private line in the first place — [improving network] control." □

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MCI fortifies int'l presence with purchase of Overseas Telecom

By Bob Brown
Senior Editor

WASHINGTON, D.C. — MCI Communications Corp. last week agreed to purchase Overseas Telecommunications, Inc. (OTI), a provider of international digital private-line services, for what sources said was about \$38 million.

The acquisition is designed to bolster MCI's presence in some international markets, particularly in Latin America. It will also enable MCI to offer customer premises-based satellite services to bypass local

carriers in foreign countries and improve route diversity with MCI's terrestrial circuits. Terms of the transaction, which is subject to regulatory approval, were not disclosed.

OTI, which provides global voice, data and video communications services via satellite and fiber-optic facilities to 27 countries, is a privately held firm based in Alexandria, Va. The company operates 24 earth stations, including 14 in the U.S., and specializes in providing customer premises-based satellite services between the

U.S. and Latin America. Those services enable U.S. users to bypass questionable local telephone networks in other nations.

With estimated revenue of \$20 million, OTI is one of a handful of small U.S. carriers that competes against AT&T, MCI and others to provide business users with international private-line services ("Small carriers make headway in int'l mart," *NW*, May 21). OTI is considered the most aggressive, yet flexible, carrier of its type.

Among its largest customers is Citicorp, which awarded OTI a contract to build a very small aperture terminal network in Latin America based on the carrier's willingness to provide concessions that others would not. For example, OTI agreed to build a new earth station at Citicorp's Pompano Beach, Fla., offices.

OTI is a major player in the international business service submarket of the international private-line market for domestic customer premises to overseas customer premises — an area where MCI has not been a player, said C. Thomas Faulders III, senior vice-president for the MCI Enterprise Group. "This, coupled with the fact that OTI had a geographical strength in South America and Africa, were the two major components that made OTI a very attractive acquisition."

The agreement should give OTI instant market credibility when pitching services to large users, said Pat Whelan, an associate at Broadview Associates, a Fort Lee, N.J., mergers and acquisitions investment banking firm for technology companies.

(continued on page 97)

MCI spending spree

Major acquisitions in 1990

Jan. 18	Twenty-five percent interest in Infonet Services Corp. for \$27.5 million by purchasing shares held by Computer Sciences Corp. MCI becomes largest shareholder.
March 8	Western Union Advanced Transmission Systems from Western Union Corp. for unspecified amount.
April 9	Telecom*USA, Inc., fourth largest long-distance carrier, for \$1.25 billion.
Sept. 18	Overseas Telecommunications, Inc. for unspecified amount.

SOURCE: MCI COMMUNICATIONS CORP., WASHINGTON, D.C.
GRAPHIC BY SUSAN J. CHAMPENY

Proteon to offer first RISC bridge/router

continued from page 4

attempt to expand its router support into the Ethernet market and said that if the company delivers on its promises with the new RISC router, it could give Proteon an edge in an increasingly competitive market. "The RISC processor is nice because it increases performance and efficiency, but since the product hasn't been formally introduced, we don't know if the actual router functions are out of the ordinary," Redman said.

Future generations of the device will support source routing and bridging for 100M bit/sec Fiber Distributed Data Interface and 150M and 300M bit/sec IEEE 802.6 metropolitan-area nets, he said.

Frame relay support

In related company news, Courtin said Proteon will announce at INTEROP that its existing internetworking routers and the RISC-based router will support frame relay as well as DECnet Phase V, which incorporates support for OSI.

Frame relay is an emerging Integrated Services Digital Network standard for an interface between two data communications devices, such as a LAN bridge and a T-1 multiplexer.

It lets devices such as LAN bridges access a wide-area backbone at speeds up to full T-1 and provides extra addressing bits to each data frame to improve routing and reduce the number of I/O ports required to let one device communicate with multiple remote sites. **■**

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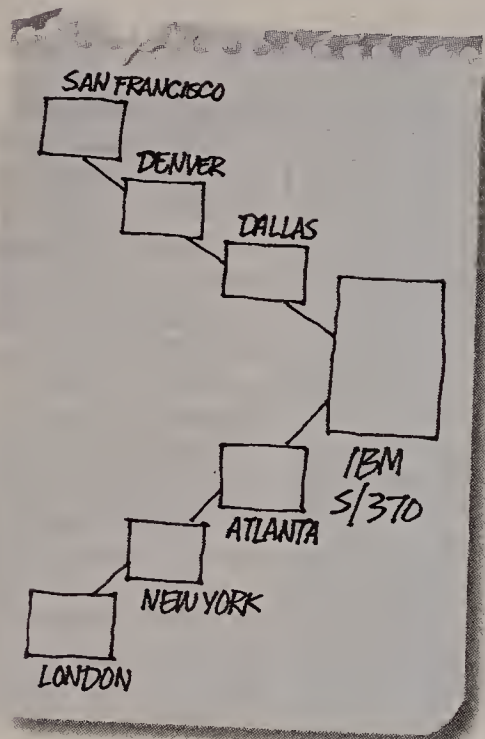


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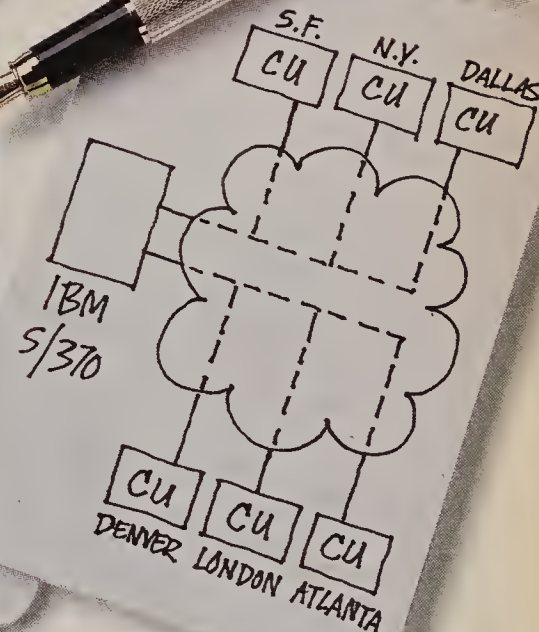
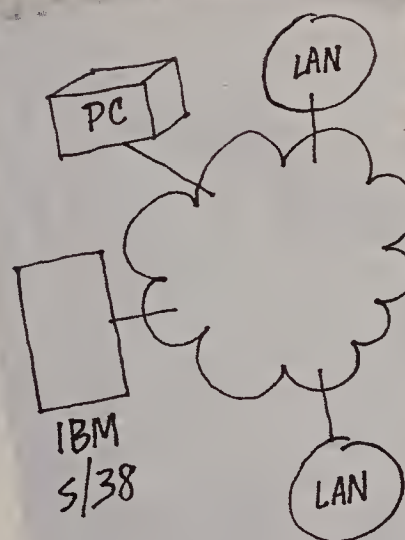
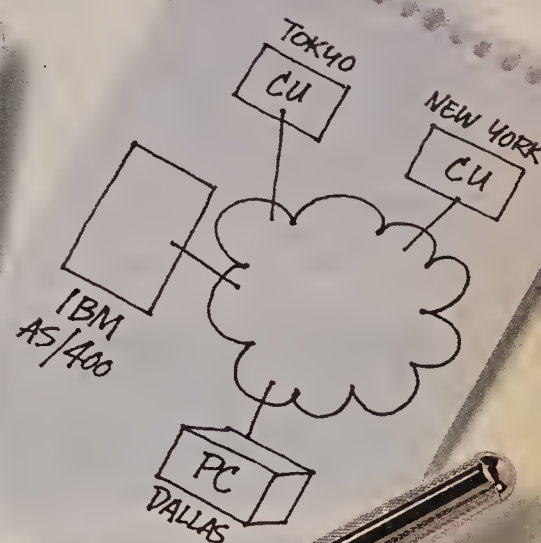
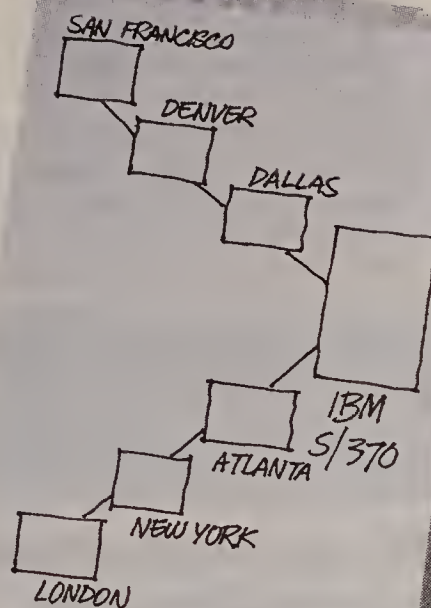
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Because now you actually have one.



IBM widens support for OSI within SAA

continued from page 1

The OSI subsystem previously supported only X.25 connections.

The Ethernet link is provided by the IBM 3172 Interconnect Controller, a device that is channel attached to mainframes and supports Transmission Control Protocol/Internet Protocol-based Ethernets.

IBM also announced a statement of direction to enhance the 3172 to support ISO 802.5 token-ring and Fiber Distributed Data Interface LANs under the OSI/Communications Subsystem.

Analysts said the LAN support should help spur user acceptance of the OSI/Com-

munications Subsystem.

"There are a lot of instances where people want OSI connectivity without using a wide-area X.25 network," said David Passmore, a partner at Ernst & Young's Network Strategies, Inc., a consultancy in Fairfax, Va. "Going through the 3172, you can hook your mainframes up to LANs and talk either TCP/IP or OSI."

Switched X.25, ISDN support

Also included in the enhanced version of the OSI/Communications Subsystem is support for switched X.25 connections and Integrated Services Digital Network links. Previously, the subsystem supported only leased X.25 and ISDN links.

The new version of OSI/Communications Subsystem is expected to be available

in November for MVS and December for VM. The onetime charge for the MVS version currently ranges from \$80,130 to \$227,700. That will increase to a range of \$83,330 to \$227,700 effective Jan. 1. The VM version ranges from \$9,985 to \$198,400 and will increase to between \$10,380 and \$198,400 effective Jan. 1.

IBM's OSI/Communications Subsystem OS/2 Extended Edition, the new version of the subsystem for OS/2 workstations, supports X.25, ISO 802.3 Ethernet and ISO 802.5 token-ring LANs. Like the mainframe version, it provides the middle layers of the OSI protocol stack. Application-layer services run on top of the subsystem and let users exchange mail or transfer files, for example, with other computers that support the protocols.

The software requires a PS/2 Model 50 or above with a 30M-byte hard disk and 7M bytes of main memory.

OSI/Communications Subsystem for OS/2 Extended Edition is expected to be available in March for a onetime charge of \$750; additional licenses will cost \$675.

IBM also announced the first application that will work with OSI/Communications Subsystem OS/2 Extended Edition. OSI File Services/2 complies with the OSI File Transfer, Access and Management (FTAM) standard for transferring and managing files between OS/2 workstations and any other system that supports a compatible version of FTAM.

The application comprises client and server software. OSI File Services/2 Server runs on an OS/2 workstation configured as the gateway to other OSI systems, which can be located on the same or a remote LAN. It manages the FTAM files, communicates using FTAM protocols with other OSI systems and responds to FTAM requests from OS/2 client workstations and other OSI systems.

OSI File Services/2 Client enables other workstations on a LAN to make requests of the server software. OSI File Services/2 is expected to be available in June for \$650. The client feature costs \$125.

OS/400 direction

IBM also last week announced a statement of direction to support its OSI/Communications Subsystem in OS/400 environments, which means all the operating systems in IBM's Systems Application Architecture (SAA) will be able to participate in OSI networks.

OSI applications — whether from IBM, third parties or users — will be portable from one operating system to another, as the SAA blueprint dictates, provided they are developed using the application program interfaces provided.

Also last week, IBM announced its intention to provide the OSI Remote Programming Interface for OS/2 and VSE-based systems. The company announced in June that the interface would support MVS and VM ("IBM cements ties between SNA, OSI," *NW*, June 25). IBM has not yet decided if it will provide the interface for OS/400.

The interface lets the services provided by one version of OSI/Communications Subsystem be shared by multiple IBM computers in a network.

IBM also unveiled IBM Open Network Distribution Services (ONDS) for MVS and VM, an electronic mail product that supports the X.400 Message Handling System standard and runs on the OSI subsystem.

The product replaces the IBM Open Systems Message Exchange (OSME). ONDS will work with OSME, but IBM said ONDS is now the base upon which all future X.400 enhancements will be based.

IBM also announced enhanced connection products that enable users of OfficeVision, Professional Office System, DISOSS or VM/Conversation Monitor System to access ONDS to participate in an X.400 network. The connection products supply the X.400 common user agent function.

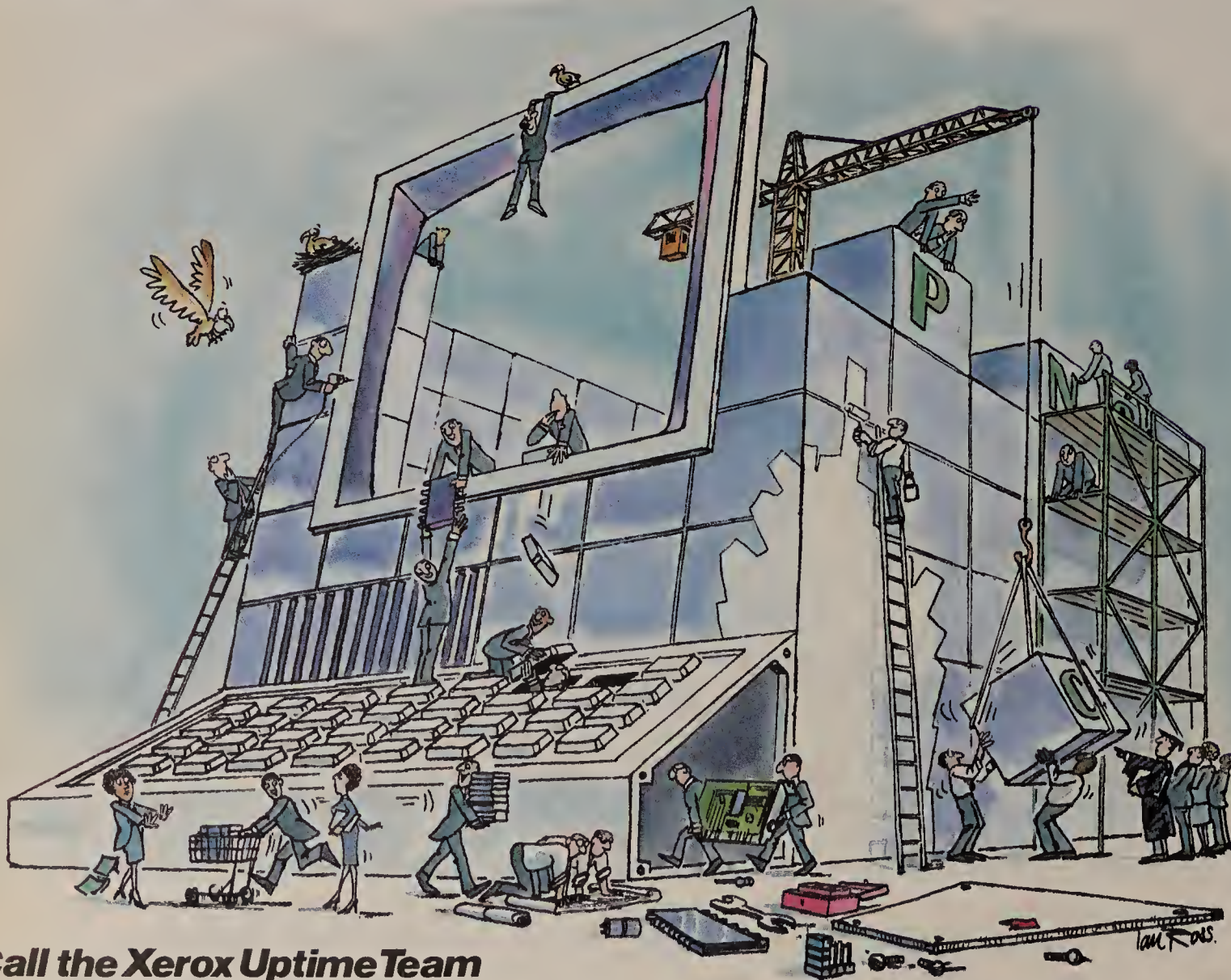
They also support both the U.S. and U.K. versions of the Government OSI Profile as well as other OSI user profiles.

IBM issued a statement of direction to supply a compatible set of X.400 products for OS/2 Extended Edition and OS/400.

ONDS is expected to be available in December for VM and in March for MVS. The packages range in price from \$6,300 to \$219,400. □

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See The FAXNeT Form on Page 62

Airline reservation nets finally see fit to dump outdated protocols

SABRE, Apollo start pulling away from proprietary technologies.

By Barton Crockett
Senior Editor

Major airline reservation networks and service providers are finally moving en masse to abandon the proprietary airline protocols they have used for more than a generation.

Among them is American Airlines, Inc., which is now phasing out the Airline Link Control (ALC) protocol that supports terminal-to-host connections in favor of X.25 packet-switching technology on its SABRE network.

The company plans to replace a series of multidrop circuits, which use ALC to carry traffic from travel agencies to a 14-node T-1 and T-3 backbone network, with a network of more than 100 packet-switching nodes.

Those nodes will shuttle X.25 traffic from travel agencies to the backbone net, which is hooked up to a massive SABRE data center in Tulsa, Okla.

In essence, this means ALC is being abandoned by its parent since the protocol was designed to meet the unique needs of the SABRE network in the 1950s, when SABRE bowed.

Another early industry pioneer, Covia Partnership, which runs the Apollo reservation network, is also in the process of phasing out ALC, as well as Synchronous Link Control (SLC), an airline protocol that supports connections between hosts. In its place, Covia will use Systems Network Architecture protocols, according to Mark Teflian, chief information officer and vice-president at the company in Rosemont, Ill.

"I was born in 1956, and a few years ago, I did some debugging using an [ALC reference] document from 1956," Teflian said. "The idea of these protocols is as old as I am. That explains [why reservation nets are abandoning them]. The code and protocol sets are totally obsolete."

One of the reasons Covia decided to migrate to SNA was to support cooperative processing, which the company believes will be a strategic technology for the Apollo net in the 1990s, Teflian said.

Other airlines and service providers that have reduced or plan to decrease their use of ALC and SLC include Delta Air Lines, Inc. in Atlanta and Arinc, Inc., an airline net service provider in Annapolis, Md.

Delta is now using X.25 instead of ALC to handle communications on its backbone network, according to Robert Woodyard, assistant vice-president for communications at the company.

Arinc is seeking bidders to supply an X.25 backbone to replace a custom SLC network and expects to award a contract by the beginning of next year, according to Bill Kiehl, an Arinc purchasing manager.

Better, cheaper and more open

According to airline network managers and consultants, ALC, SLC and other proprietary airline protocols are being phased out because they are poorly suited to deal with the sophisticated communications needs of modern airlines.

For example, ALC, with its 6-bit-per-character structure, can only support 64 characters per block, while other protocols can support much larger blocks. Thus,

ALC limits the amount of information that can be communicated between a travel agent's terminal and an airline's host processors, and it slows response times.

Additionally, network management capabilities for ALC and SLC are considered to be poor, and the protocols are becoming increasingly expensive to maintain as vendors scale back support for them. For example, IBM is not supporting SLC on its 3745 front-end processors, according to

Michael Doyle, director of data network services with Aeronautical Radio, Inc., an Arinc unit.

Technologies such as SNA and X.25 are also better suited for tasks such as cooperative processing and X.400-based messaging, and they are easier to gateway to other networks. William Jewell, managing director of communications engineering at American Airlines, said the company is planning to use X.400 gateways on its X.25 network to interconnect SABRE to other value-added networks.

Snail-paced migration

While all the various industry players are finally moving away from the proprietary protocols, the process is slow because the protocols are so widely used. For

example, Covia began replacing SLC and ALC with SNA in 1986 but won't finish the job for several years largely because its embedded base of ALC and SLC is so huge, Teflian said.

And even though Delta cut over a network of 11 X.25 packet-switching nodes two years ago, the company still uses ALC to carry traffic from travel agency terminals to the packet nodes, Woodyard said.

Robert Mann, a vice-president at SH&E, Inc., an airline consultant in New York, predicts that ALC and SLC will continue to be widely used in many areas of the world for the foreseeable future because of the great expense involved in swapping the technologies out and lack of demand for modern airline network services in some countries. ■

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Users, telcos ready EDI spec for phone bills

By Bob Wallace
Senior Editor

PALM SPRINGS, Calif. — Users and carriers are meeting here next week to approve the industry's first specification for transmission of telephone bills via electronic data interchange.

The Consolidated Service Invoice/Statement details how carriers will format telephone billing information, including

bill summary and call detail data, for electronic delivery over EDI networks.

The specification, which could become an ANSI standard by December 1991, is the culmination of two years of work by the Telephone Bill Working Group (TBWG), an ANSI X.12 subcommittee formed by users and carriers in 1988.

TBWG is a broad-based group that includes the seven regional Bell holding companies, AT&T, MCI Communications Corp., US Sprint Communications Co., independent phone companies, Bell Communications Research and large users.

Users involved in the standards effort include Union Pacific Railroad Co., E.I. du Pont de Nemours & Co., Texas Instruments, Inc., J.C. Penney Co., Inc., Georgia Power Co., Sears, Roebuck and Co., and

the U.S. General Services Administration.

Members of the TBWG are expected to finalize the specification next week and send it out to the full ANSI X.12 committee for review. The TBWG will use a streamlined resolution process to resolve any concerns voiced by the X.12 committee. Final X.12 approval is expected by December, according to former TBWG Chairman Carl Doenitz of US West Communications in Bellevue, Wash.

Replacing paper bills with on-line invoices will enable users to cut costs associated with manually keying in massive amounts of billing information, prevent errors in data input and free employees for other tasks.

"This is the brightest opportunity we've ever had in [the] telephone billing [area],"

said Ron Tucitto, senior manager of business planning at Union Pacific Railroad in Omaha, Neb.

Union Pacific Railroad would save \$1.2 million a year if its telephone companies replaced their paper bills with invoices transmitted using EDI, Tucitto said. Each month, two employees at the company together input 7,000 to 8,000 telephone bills for a variety of carrier services.

Union Pacific Railroad would cut costs by eliminating paper billing and by freeing up employees, who now input data, to spend their time checking bills for errors and telephone fraud.

New level of cooperation

Doenitz said development of the specification required an unprecedented level of cooperation between telephone companies and customers.

"We have a solid, technically sound specification developed by the industry for the industry," Doenitz said. "The specification was made flexible enough to completely cover each carrier's needs."

The TBWG established a formal liaison with the U.S. Telephone Association (USTA) to keep the group apprised of TBWG's efforts and ensure broad support for the specification, Doenitz said. The USTA is a national trade association comprising 1,063 telephone companies.

Carriers will reformat monthly telephone bill data into the Consolidated Service Invoice/Statement and transmit the bills directly or via a third-party value-added network to their customers.

Current EDI users may be able to use existing purchase order and invoice translation software to convert billing data from the specification to a flat file format used by their internal accounts payable applications, Doenitz said. In anticipation of the standard, New Brunswick Telephone Co. in Canada and Southern New England Telephone Co. in Connecticut are pilot-testing billing systems that utilize the Consolidated Services Invoice/Statement format.

"From [those companies'] early reports, the specification has worked well and their customers are quite pleased about receiving their telephone bills using EDI," Doenitz said.

Software developers at large user firms such as Union Pacific Railroad have already begun writing translation software that converts data in EDI telephone bills for internal applications.

"We realize the specification may be tweaked here and there on its way to becoming a standard, but we don't want to wait until then to get moving," Tucitto said.

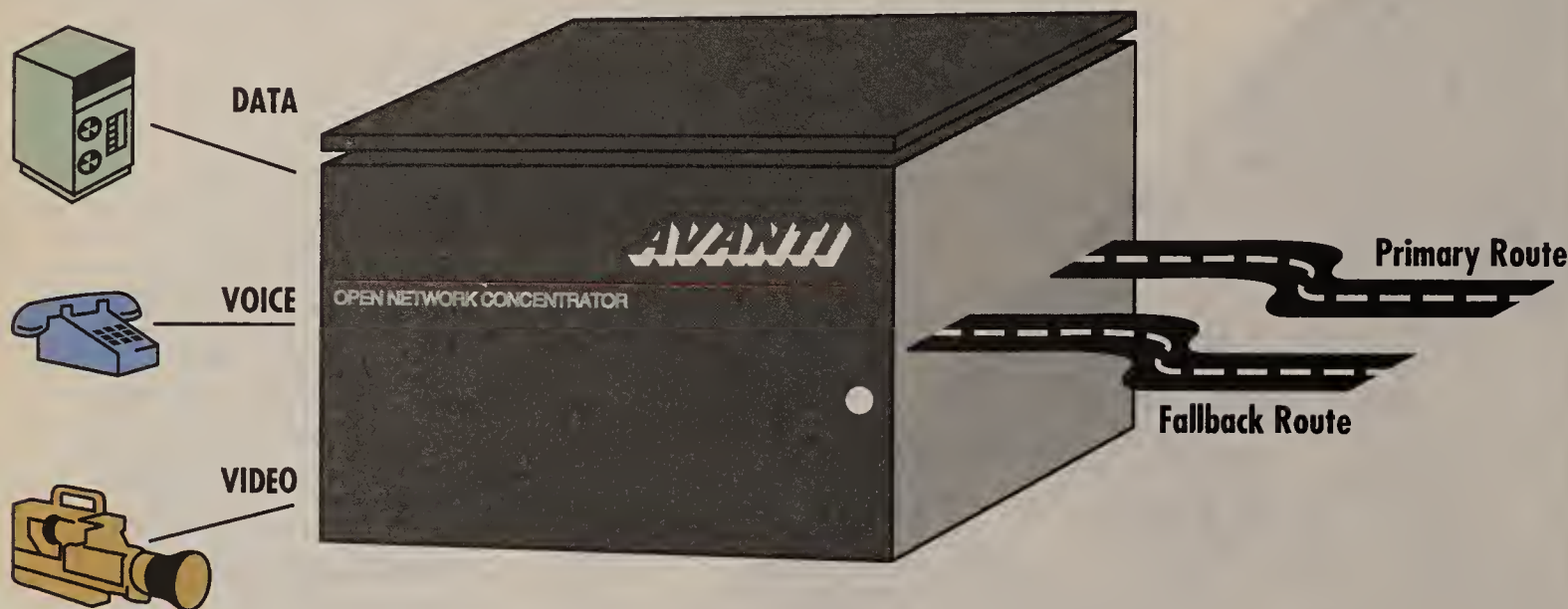
Burlington Industries, Inc., a longtime EDI backer, views telephone bill delivery via EDI as a potential means of controlling communications costs.

"Billing is the biggest administrative nightmare we face," said Linda Sullivan, telecommunications manager for the Greensboro, N.C., textile manufacturer. "We see EDI as a way to streamline our bill processing and payment operations without hiring additional staff."

AT&T tried unsuccessfully to persuade the firm to take part in a beta test of its EDI billing service, which is based on a specification the TBWG discarded in 1989, Sullivan said.

"It was an interesting plan, and there were a number of advantages to using the service, but it was based on a nonstandard specification," Sullivan recalled. "We didn't want to be trapped in a proprietary EDI billing service." □

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complies with Publication 54019A, AT&T's Intermediate Bit Rate Standard for Fractional T1.

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INDUSTRY UPDATE

VENDOR STRATEGIES, MARKET TRENDS AND FINANCIALS

Worth Noting

Local telephone companies "will continue to change out analog equipment slowly and take advantage of the ability to bring services to market more quickly only in regions where the capital investment will yield swift and significant returns."

Karen Scherberger
Analyst
Northern Business Information
New York

Congressmen balk at FCC plan to deregulate AT&T

Reps. Markey, Cooper vow to defeat proposal.

By Ellen Messmer
Washington Correspondent

WASHINGTON, D.C. — Members of Congress promised long-distance carriers and equipment vendors at a recent industry conference that they would work to defeat the Federal Communications Commission's proposed plan to lift AT&T's regulatory constraints.

Rep. Edward Markey (D-Mass.), chairman of the House Telecommunications and Finance Subcommittee, and Rep. Jim Cooper (D-Tenn.), a committee member, condemned the FCC initiative that would allow AT&T to make customer-specific offerings and offer free or discounted equipment bundled into transmission offerings.

In addition, Terry Haines, chief minority counsel for the House Telecommunications and Finance Subcommittee, said Republicans also oppose the FCC plan. Haines said the FCC's conclusions about the deregulation of AT&T were jarring to many on Capitol Hill, particularly Rep. Thomas Tauke (R-Iowa) and Rep. Al Swift (D-Wash.).

"The commission has not convinced many people on the Hill,"

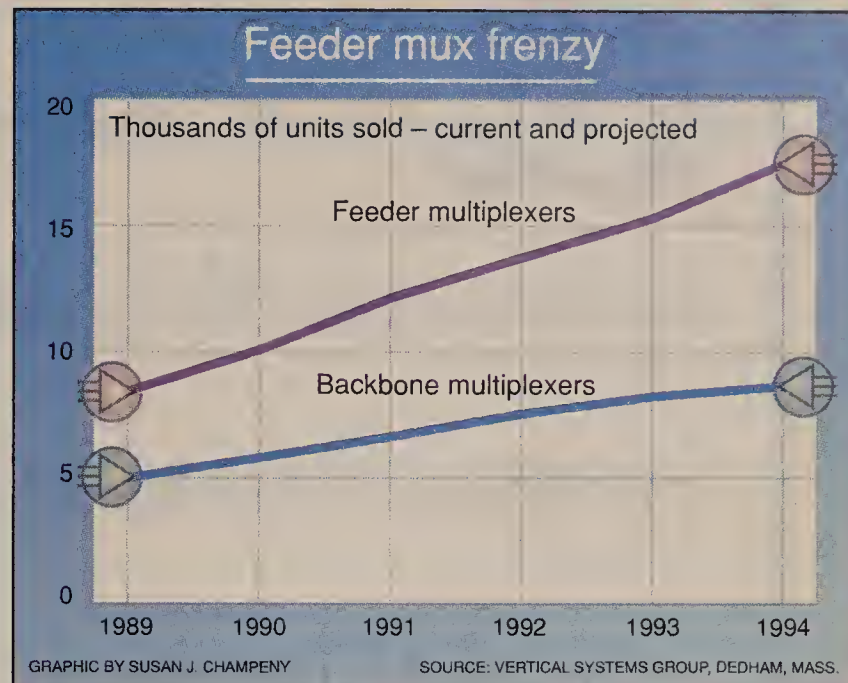
Haines said, adding that from the Republican perspective, the AT&T deregulation plan is viewed as too much, too soon. He said the commission "does itself no favor" by proposing such a severe regulatory shift only one year after implementing price caps for AT&T.

In the world of Washington politics, where favors and compromises shape opinion, the commission's rulemaking proposal "may not pass the red face or smell test," Haines warned. "The FCC will waste vital political capital on this issue."

Speaking at the Competitive Telecommunications Association (COMPTEL) conference here, Markey said that to permit AT&T the freedoms proposed under the FCC rulemaking would be "like Gulliver asking the Lilliputians to untie him and then promising to step carefully in the future."

Last March, the FCC issued a notice of proposed rulemaking which, if enacted, would radically transform the telecommunications marketplace by doing away with service tariffs in favor of allowing AT&T to file customer-specific contracts for business

(continued on page 15)



T-1 mux suppliers wage low-end battle

Faced with stagnant high-end sales, companies concentrate on hawking 'feeder-type' muxes.

By Bob Brown
Senior Editor

Faced with slumping domestic sales of high-end T-1 multiplexers, vendors are fleshing out their product lines with low-end units to meet rising demand for multiplexers that can patch small, remote sites onto a backbone net.

The increased activity in the low-end T-1 multiplexer market is expected to broaden the market selection for buyers and force prices lower, though analysts said pricing has just about bottomed out.

Attendees at this week's Telecommunications Association, Inc. (TCA) trade show in San Diego may see a flurry of low-end multiplexer and intelligent channel bank announcements, analysts said.

"I think you'll hear more low-end multiplexer announcements at TCA this year than anything else," said Rosemary Cochran, a principal at Vertical Systems Group, a Dedham, Mass.-based firm that recently issued a T-1 market report.

Multiplexer makers said the market for feeder multiplexers is on an upswing. Many users that installed T-1 backbones in the past five years now want to use feeder units to tie small and remote sites onto those backbones.

"It's clear that one of the growth areas in high-speed digital networking is in the feeder mux market," said Steve Levy, a senior technology analyst at Hambrecht & Quist, Inc., an investment firm in New York.

Rick Malone, a principal at Vertical Systems Group, estimated that worldwide shipments of feeder multiplexers will more

than double, from 8,388 units last year to 17,452 units in 1994. The market for backbone multiplexers will grow at a slower rate, with unit shipments increasing from 4,962 last year to 8,605 in 1994 (see graphic, page 11).

As a result, Newbridge Networks, Inc., Telco Systems Network Access Corp. and other vendors that lead the low-end multiplexer market are facing increased competition.

Last week, for instance, Network Equipment Technologies, Inc. reconfirmed its commitment

Multiplexer makers said the market for feeder multiplexers is on an upswing.

▲▲▲

to the low-end multiplexer market by announcing a new feeder multiplexer based on technology from Coastcom, Inc., a Concord, Calif.-based firm ("NET makes another run at T-1 mart with ADNX line," NW, Sept. 17).

NET's new Access Digital Network Exchange (ADNX)/48 Integrated Access Manager fills a missing hole in the company's product line that it failed to plug with last year's introduction of the Integrated Digital Network Exchange (IDNX)/10. Users deemed the IDNX/10 to be too expensive to put at remote sites. The ADNX/48 is priced between

(continued on page 15)

INDUSTRY BRIEFS

MCI, Racal-Milgo strike marketing deal. MCI Communications Corp. and Racal-Milgo last week announced a marketing agreement in which the two companies will cooperate in the sale of voice and data communications products and services. MCI will sell Racal-Milgo's customer premises equipment and network design and support services, including Racal-Milgo's Excalibur digital access products and Communications Management Series 400 network management systems. Racal-Milgo will sell MCI voice and data services, including point-to-point digital data service and digital private-line service.

ACC's Series 400 to support least-cost routing. Internetworking vendor Advanced Computer Communications (ACC) last week said it will support the Open Shortest Path First (OSPF) routing protocol in its Series 4000 bridge/routers. OSPF supports a least-cost routing algorithm that allows network administrators to distribute traffic over the most cost-efficient routes. According to Gary Krall, ACC's director of marketing, OSPF will run alongside the Routing Information Protocol, which maintains and updates routing tables.

ACC is expected to ship Series 4000 units with OSPF support in January.

Vitalink lays off 32. Vitalink Communications Corp. last week said it completed a company restructuring in which it laid off 10% of its work force to reduce costs. The company said the layoffs stemmed from the consolidation of a number of field sales offices, resulting in the dismissal of 32 employees. The restructuring will enable Vitalink to increase its product

(continued on page 14)

People & Positions

Hatfield Associates, Inc., a Boulder, Colo.-based telecommunications technology, policy and economics consulting firm, last week named **Daniel Kelley** a senior vice-president.

Kelley will be involved in a variety of economic, policy and industry studies undertaken for Hatfield Associates' base of telecommunications clients.

Previously, Kelley was director of regulatory policy for MCI Communications Corp. in Washington, D.C.

William Conway recently was named vice-president of marketing for **Forval America, Inc.**'s Modem Division, which sells high-speed modems.

Conway will oversee Forval America's national and international marketing efforts and manage the introduction of new modem offerings and other communications products into the market.

The Modem Division, based in Salt Lake City, is a newly created subsidiary of Forval America.

Previously, Conway was the product line manager for high-speed modems at Rockwell International Corp.'s Digital Communications Division in Newport Beach, Calif. □



9:45 P.M. Welcome. This is Guest Messaging. You received


one call before you checked in. Message one: "John, this is Ted. They

moved our meeting up to 8:30. I'm not sure where, yet. I'll call you in the

morning to let you know." **10:00 P.M.** "I'd like a wake-up call for

6:00 A.M. And can you put a Do Not Disturb on my phone? Thanks."

10:06 P.M. We're sorry, room service is now closed. You can place a

breakfast order by pressing 3.  "I'd like two eggs, over

easy, with bacon. Make sure the bacon's crispy. Toast,

lightly buttered. Freshly-squeezed orange

juice. And coffee, black. To room 235 at

6:15 A.M." **6:00 A.M.** Good morning.

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your wake-up call. You have one new voice message.  Message one:

"John? Ted again. Don't forget to bring the revised contract to the meeting.

Still don't know what room we're in." **7:00 A.M.** To record your

own personal greeting, press 7.

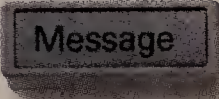
 7^{PRS}

"I just went down for a quick

workout. I'll be back in a few minutes.

Leave your message at the sound of the beep."

7:20 A.M. You received one new voice message.

 Message

Message one: "John, we're in the Green Room.

See you there at 8:30. Oh, and that fax number you

need is 555-4473." **8:00 A.M.** "Checking out?" By the

way, Mr. Siebert, if you need to hear any of your existing voice

messages, you can access them for twenty-four hours. Just call us."

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NORTHERN TELECOM

TECHNOLOGY THE WORLD CALLS ON

PacBell restructures, takes less hierarchical approach

By Bob Brown
Senior Editor

SAN FRANCISCO — Pacific Bell recently announced plans for a major corporate reorganization that is designed to help the

carrier become more responsive to customer needs by distributing decision making to regional executives.

Unlike Pacific Bell's existing centralized, hierarchical struc-

ture, the reorganization calls for a more distributed approach under which the company will set up separate profit and loss centers headed by their own executives.

This will give the vice-president/general manager heading each regional market more control over a range of functions from providing communications services to performing installation. These services were previ-

ously administered on a centralized basis.

"The structure now allows for only one profit and loss center, and that's me," said Phil Quigley, Pacific Bell's president. "But we should share profit and loss responsibility."

Effective Jan. 1, Pacific Bell will be divided into four groups:

■ **Regional markets**, consisting of seven business units fo-

cused on specific geographic areas of California. Each regional unit will be headed by a vice-president/general manager who will be responsible for communications products and services to both business and residential customers.

■ **Statewide markets**, consisting of six business units focused on customers and markets that cross the boundaries of the seven regional markets.

Among the six business units created is a national unit that will handle accounts for large customers whose business and telecommunications requirements are national in scope.

■ **Product and technology support**, which includes product development as well as network operations.

■ **Corporate support**, including human resources, strategy and planning, external affairs, and legal and financial activities.

Smaller business units should be a boon for customers seeking more personalized service, Quigley said.

"The decisions and accountability for meeting customer needs will be driven down to local levels, where employees are more in touch with their customer needs and competitive threats," he added. □



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Industry Briefs

continued from page 11

development investment in 1991 to expedite the availability of new products.

Donald Herman, Vitalink's chairman and chief executive officer, said in a statement the company is experiencing "a slowness in orders worldwide, which we attribute to general economic uncertainties and current business conditions."

Apple's 7.0 delayed.

Apple Computer, Inc. last week said it would delay the release of its System 7.0 operating system for its Macintosh microcomputer line until the first half of next year. System 7.0, which is to include a number of networking extensions, was scheduled to ship by year end.

Oracle preps for layoff.

Oracle Corp. last week said it will lay off 400 employees, or 4% of its domestic work force, due to anticipated first-quarter losses.

The company, having budgeted for a 50% growth in fiscal year 1991, said the cuts were necessary to achieve 25% revenue growth projected for fiscal year 1991.

Further, the Oracle USA Finance and Administration group, which was established two years ago to handle contract administration and order processing, was folded back into the company's Corporate Finance and Administration group, eliminating redundant positions in the process. □

See The FAXNeT Form on Page 62

continued from page 11

Larry Kollie, manager of telecommunications for Tultex Corp., a Martinsville, Va.-based textile maker and NET customer, said that given his company's sat-

continued from page 11

"People talk about AT&T
(continued on page 93)

while, do not seem too concerned about the new competition, whose products they said have many shortcomings. For example, they cited an initial lack of management capabilities for NET's new ADNX/48 multiplexers under the company's existing network management scheme, largely because the ADNX/48 technology has been borrowed from another vendor. □

15

The big one that got away.



Not long ago, Mr. Horace Abercrombie, head buyer for a large chain of seafood restaurants, made an important phone call to his *then* major fish supplier. It seems that with all of the excitement of planning a two-for-one promotion, Horace had completely overlooked ordering a couple of extra tons of delectables from the deep.

Horace dialed his supplier and heard, "Please wait for the next available operator." He did as he was asked, and waited. And waited. Soon, Horace developed a frustration that even the soothing pan flute music in the background couldn't assuage.



Horace began to panic that this delay would put his promotion in jeopardy. That's when he remembered a visit from Forward-Thinking Fresh Fish Inc.

Locating the energetic young salesman's card next to the antacid in his desk drawer, Horace hung up and then dialed Forward-Thinking's number. Upon hearing, "Please hold and a representative will be with you in two minutes," he sighed with relief.

You see, since he knew *when* his business would be tended to, he didn't get uptight. Before long, Forward-Thinking had reeled in a new account. And Horace's old supplier had let a big one get away.

There's a moral to this fish story.

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you service clients quickly and efficiently, they could be lured away by the



competition. That's why we developed IQueue™ — a revolutionary new capability for Rockwell's industry-standard Galaxy™ ACD systems.

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Just like Horace, callers tend to get a bit impatient waiting on ordinary ACDs. IQueue, on the other hand, tells them how long they'll be on hold.

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With IQueue's upcoming Automessage Delivery™ feature, your callers will be able to leave a message that holds their place in queue. IQueue will then automatically return the call. All of this means your company saves on toll charges incurred from holding.

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We could go on and on about how smart IQueue is. But there's really only one way for you to find out. Just call us at **1-800-722-5959** to arrange a free demonstration. We'll be glad to show you why IQueue not only keeps the big ones from getting away, it actually makes them delighted that they're caught.



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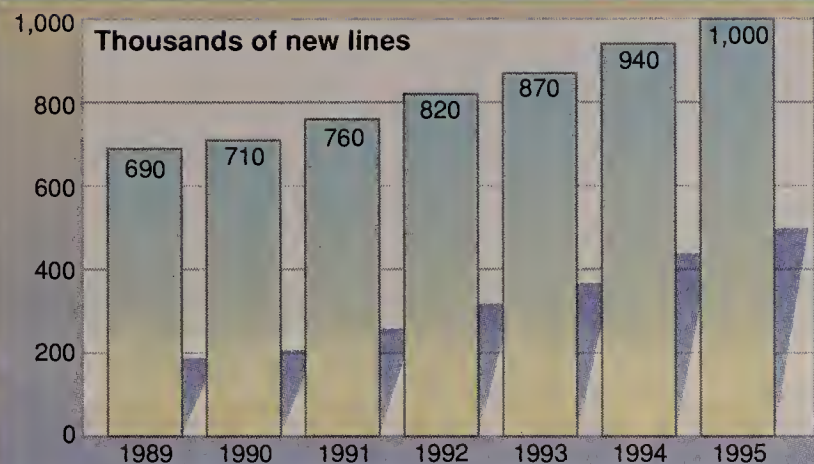
CARRIER SERVICES, CENTREX, CPE, WIRING SYSTEMS AND BYPASS

Worth Noting

“Users aren’t buying ISDN service because they have a set use for it; they’re buying it to experiment with its capabilities and because they think they may need it in the future.”

Richard Kuehn
President
RAK Associates
Cleveland

Centrex line shipments to edge upward



GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: EASTERN RESEARCH CORP., PARSIPPANY, N.J.

FTS 2000 users, AT&T eye formation of user group

Telecom mgrs. eager to discuss billing concerns.

By Ellen Messmer
Washington Correspondent

WASHINGTON, D.C. — Government telecommunications managers struggling with Federal Telecommunications System (FTS) 2000 network administration problems are eager to see the formation of a user group to share their common concerns.

AT&T, the primary long-distance vendor for U.S. government agencies under the FTS 2000 contract, said it is willing to sponsor a user group, adding that the group would be an ideal marketing forum for FTS 2000 services. Government telecommunications managers, however, indicate they will only support the group if it is a forum where they can air concerns.

William Cunnane, the deputy assistant commissioner at the General Services Administration who oversees management of the FTS 2000 contract, takes credit for urging AT&T to establish a user group. But he said the group's chair must be a user — not AT&T — and users must control the agenda.

Doyle Girouard, AT&T's director of sales and marketing for FTS 2000, said the firm is evaluating the results of a recent survey about interest in a user group and will soon decide how to proceed.

Telecommunications managers eager to resolve certain nagging problems would be certain to use the FTS 2000 user group to bring up complaints about order processing and billing.

Sidney Haggard, communications network director at the Department of Agriculture, said about five telecommunications directors already met informally to discuss the FTS 2000 network.

Although Haggard is not in favor of a user group run by AT&T, other managers have said they

would welcome a user group where AT&T handles administrative functions but takes a backseat on the subject matter.

Users grumble

User complaints center on administrative functions, not network performance. According to AT&T, the number of trouble reports made during the transition from the old FTS network has been extremely low.

But users complain that AT&T is not delivering the administrative service they expect. The Department of Agriculture is one of the biggest FTS 2000 customers, spending about \$2.8 million on data communications per month.

Cunnane said the group's chair must be a user and users must control the agenda.

▲▲▲

Haggard, who is preparing for a planned Jan. 1 data communications cutover to AT&T from the old FTS, complained that AT&T has not yet made available a promised order entry system that would allow him to track the approximately 10,000 orders he will soon submit.

Girouard said the FTS 2000 order entry system, currently used only by AT&T and designated GSA administrators, will be made generally available to users at an unspecified date.

Cunnane, noting that the system was promised to users under the FTS 2000 contract, said the

(continued on page 24)

RBHCs try to thwart high court decision

Ask the Supreme Court not to rule on validity of the Consent Decree's services restriction.

By Anita Taff
Washington Bureau Chief

WASHINGTON, D.C. — The RBHCs recently tried to head off a Supreme Court decision on the validity of the Consent Decree's information services restriction by asking the court to turn down an appeal request.

In a brief filed at the U.S. Supreme Court earlier this month, the regional Bell holding companies said there was no reason for the highest court in the land to get involved in a "narrow dispute over the standards for removing the information services restriction."

In May, a coalition of vendors and user and consumer groups argued that a lower court had made legal errors important enough to warrant a Supreme Court review. That court said U.S. District Court Judge Harold Greene erred legally in a 1987 review of the Consent Decree when he decided to continue the prohibition keeping the RBHCs from offering information services.

The coalition — which included the Ad Hoc Telecommunications Users Committee, the Consumer Federation of America, the Independent Data Communications Manufacturers Association, Inc. and MCI Communications Corp. — asked the Supreme Court to step in because correct interpretation of the Consent Decree "affects the lives of most Americans, as well as billions of dollars of annual investment in 'a vast and crucial sector of the economy.'"

Renewed efforts

Many of the same members of the coalition last week renewed their efforts to win Supreme Court review by filing a joint letter that disputes some of the RBHCs' arguments from earlier this month.

User and consumer groups claim that if the RBHCs are allowed to provide information services, they will use their control of the local exchange to drive

(continued on page 24)

WASHINGTON UPDATE

BY ANITA TAFF

FCC finds two Tariff 15 deals unlawful. During the last two weeks, the Federal Communications Commission has thrown out two of AT&T's Tariff 15 deals, citing them as unlawful due to provisions AT&T included to compensate users for installation delays.

The FCC objected to a provision in which AT&T said it would credit the users' accounts and lessen the term commitment of the deals according to the length of delay.

Consequently, the FCC rejected the Tariff 15 deals because AT&T failed to supply data showing how the credits would affect the overall profitability of the deals. Because AT&T is a dominant carrier, it must show that its services will pay for themselves to prevent cross-subsidization between offerings.

The FCC quashed one deal that would have given PepsiCo, Inc. a 15% discount on Software-Defined Network (SDN), Megacom 800, Basic 800 and 800 Readyline services. The FCC also rejected a deal in which AT&T offered the Original Cookie Co. a \$20,000 credit in exchange for purchasing a two-year contract for SDN or Megacom 800.

Additionally, the ruling throws into question two other Tariff 15 deals awaiting FCC action since they contain reimbursement provisions similar to the PepsiCo deal. Those offers are for Schwan's Sales Enterprises, Inc. and Deluxe Corp.

AT&T last week said it is confident its other Tariff 15 deals will be approved.

"We thought all of the cost support was there," an AT&T spokesman said. "We don't buy the notion that it was lacking."

AT&T has filed Tariff 15 deals for 12 customers.

Of those, five have either been rejected or withdrawn by

(continued on page 24)

Carrier Watch

Southwestern Bell Telephone Co. and SBC Technology Resources, Inc. recently announced they will begin a laboratory trial of Southwestern Bell's Switched Multi-Megabit Data Service (SMDS) next month.


In the SMDS trial, two of the company's laboratories, located 20 miles apart in St. Louis, will be linked via fiber. The trial will be based on the IEEE 802.6 standard for metropolitan-area networks.

Southwestern Bell's Advanced Technology Laboratory and SBC Technology's Advanced Networking Laboratory will be equipped with a prototype switch from AT&T Network Systems Group.


The trial link will be used to support a variety of high-bandwidth applications.

Steve Crider, Southwestern Bell's technical trial project manager for SMDS, said the test will let the firms involved verify SMDS features before the phone company offers the service commercially.

AT&T recently announced that it landed a three-year, \$45 million contract to provide long-distance service to 62,800 room phones and pay phones at Motel 6 locations. The carrier claims it now provides long-distance service to 13 of the 15 largest hotel and motel chains in the country. AT&T also provides switches and networked computers to Motel 6. ■



I'm at the San Diego Zoo. It's Sunday and I'm watching "Not a bad deal for the ape. Free food, big house, no job on big mortgage and I'm here on business. And it occurs to sit around all day and throw banana peels at each other. my shoulder and says, "Yeah, the ape is pretty advanced, you'll see at the AT&T BOOTH, #1028, at the TCA Messaging. Amazing stuff people can really use. Millions of good news to me, being a TCM, but not the kind of obvious question: "Hey, fly, where are you staying?" And he of room. Fantastic views ... ". And the ape eyed him



*this ape watch me watch him and I think to myself:
Monday." Me, on the other hand, I'm hungry, I've got a
me that the apes have us running the planet so they can
And just as this new theory is taking shape, a fly lands on
but not as advanced as all the new products and services
Conference and Expo. DEFINITY[®] System. AUDIX Voice
years ahead of anything the apes have got going." This is
discourse you generally hear from a fly, so I ask the
says, "I found a great place on the beach. Free food. Plenty
contemptuously from behind the bars.*



AT&T

The right choice.

Carrier-based voice-messaging services offer alternative to CPE

The trick is service evaluation and mapping options to needs.

First in a two-part series.

By Maralyn Rosenblatt
Special to Network World

Historically, voice-messaging services have been provided from in-house systems or from independent service bureaus. But in March 1988, U.S. District Court Judge Harold Greene gave the green light to the regional Bell holding companies to enter the market.

Now, 2½ years later, companies such as Bell Atlantic Corp., Pacific Bell and Southwestern Bell Corp. top the list of carriers offering voice-messaging services.

Customers can use the services as their only means of voice messaging or as an adjunct to existing voice-messaging systems. The services are particularly appropriate for Centrex sites and suitable for branch offices that may not be able to justify the capital outlay required for a stand-alone voice-messaging system.

Although there are differences between each carrier's service, many of the same things must be taken into consideration

Rosenblatt is a senior telecommunications systems specialist with Lockheed Corp. in Calabasas, Calif.

with all of the offerings. Users must decide how many mailboxes are needed, what the mailbox application should do and how end users will access the service.

The initial number of subscribers determines the short-term mailbox requirements, but it is also important to estimate how many additional mailboxes might be required over the long term.

Potential applications for voice-messaging services are limitless, running the gamut from simple voice messaging to more complex call processing applications in which callers are greeted and offered a menu of options.

The messaging services can be accessed using a number of different voice services, including 800, direct-inward dial or dedicated lines.

Mailbox features are provided on a standard or optional basis. Standard features usually include: personal greeting (with a specified length), message sending/reviewing/recording capability, message notification, date/time stamp, adjustable voice-prompt level (such as abbreviated or standard), number of messages, saved message retention, password protection and group messaging.

Optional features often include paging,

stutter dial tone and call forwarding. Reporting capabilities are usually provided, either on a standard or optional basis.

Service fees

The services carry various recurring and onetime charges. Onetime charges are incurred for service installation and activation; recurring service charges are incurred on a per-mailbox per-month basis.

Monthly recurring charges are also incurred for optional features and may be charged on a per-mailbox or per-system basis. For example, stutter dial tone and operator revert may be provided on a

sionals must first determine if the services are appropriate for their companies.

To make this determination, several planning-related issues must be considered. These issues provide a frame of reference and assist in answering the question: "How will these services fit into my company's current telecommunications environment?"

These issues are:

- Understanding your company's embedded base of systems and services, view of technology, financial picture and short- and long-term business goals.
- Knowledge of current vendor offerings

Knowing that the services exist is one thing, but evaluating them effectively is another. Even before the services can be evaluated, telecommunications professionals must first determine if the services are appropriate for their companies.

▲▲▲

monthly per-mailbox basis, while paging may be provided on a systemwide basis.

Recurring usage charges may also be incurred. These costs might be calculated on a per-minute basis or other time increment.

Most of the local exchange carriers also offer tiered pricing, which provides price breaks for a predetermined number of mailboxes. Each tier has a specified set of features and monthly charges per mailbox.

As one might expect, there is also a direct correlation between the commitment for the number of subscribers, the monthly mailbox charge and the agreement terms. In other words, the greater the number of mailboxes used and the longer the agreement term, the lower the monthly mailbox charge and the more features/parameters that will be provided.

In general, prices are typically negotiable with the carrier because the services are nontariffed offerings.

Pacific Bell uses tiered pricing with its two voice-messaging services, VoiceMail Series 50 Service and VoiceMail Series 100 Service.

Companies that use as many as 24 mailboxes on VoiceMail Series 50 Service pay \$19.95 a month for each mailbox. Service features include a maximum message length of three minutes and storage of 30 messages for 14 days. The greeting length must be less than two minutes.

The service supports four-digit passwords and as many as 15 group distribution lists; paging is optional. The system will retry the page a maximum of four times.

Companies that use more than 100 mailboxes on VoiceMail Series 100 Service pay \$10 a month per mailbox and 10 cents a minute for usage.

The service supports messages of 20 seconds to eight minutes in length, supports a maximum of 2,000 messages and retains them for two to 365 days. The greeting length can from 15 seconds to eight minutes. The service supports four- to eight-digit passwords and as many as 15 group distribution lists. Paging is optional. The system will retry pages a maximum of 10 times.

Knowing that these services exist is one thing, but evaluating them effectively is another. Even before the services can be evaluated, telecommunications profes-

sionals must first determine if the services are appropriate for their companies.

via discussions with industry contacts, conversations with vendors and information from the trade press.

■ A flexible approach for judging the appropriateness of new telecommunications offerings, determining deployment time frames and selecting planning horizons.

Fitting in

The planning process must take into account the company's embedded base of systems and services, its view of new technology, its financial picture and goals.

Voice-messaging systems have to be able to fit in with existing telecommunications systems and services. A company's view of technology may dictate proceeding with caution whenever new technology is suggested or may welcome new technology with open arms.

In either case, understanding this perspective is crucial to the success of technology projects. A company's financial picture will determine whether funds are available for procuring new systems or services. A firm's policy concerning leasing or purchasing new systems or services, as well as its short- and long-term goals, must also be considered. These goals relate to the company's trends regarding centralization, downsizing and regionalization, for example.

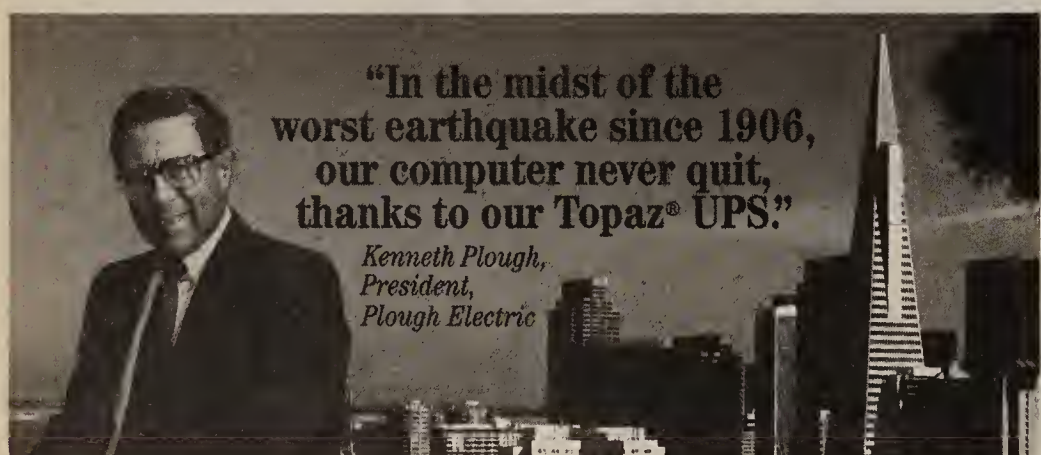
The second planning issue involves obtaining general information regarding current vendor voice-messaging offerings. This information may be acquired by reading trade journals and calling significant vendors.

By calling vendors located in the same vicinity as your company's offices, you can obtain answers to the following critical questions:

- What services are currently available?
- What are their basic capabilities?
- What are the implementation time frames?

The third planning issue relates to having a flexible decision-making approach. This involves keeping an open mind when judging the appropriateness of the services, making decisions regarding their procurement and determining the time frame for installation. □

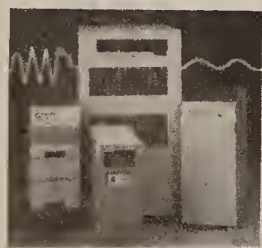
Next week, Rosenblatt will examine the evaluation process of voice-messaging services.



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Kenneth Plough,
President,
Plough Electric

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moved four feet across the floor — and kept on running! "After the shaking stopped, we were the first outfit back on its feet, supplying electrical components to the rest of the community," said Kenneth Plough, company president.

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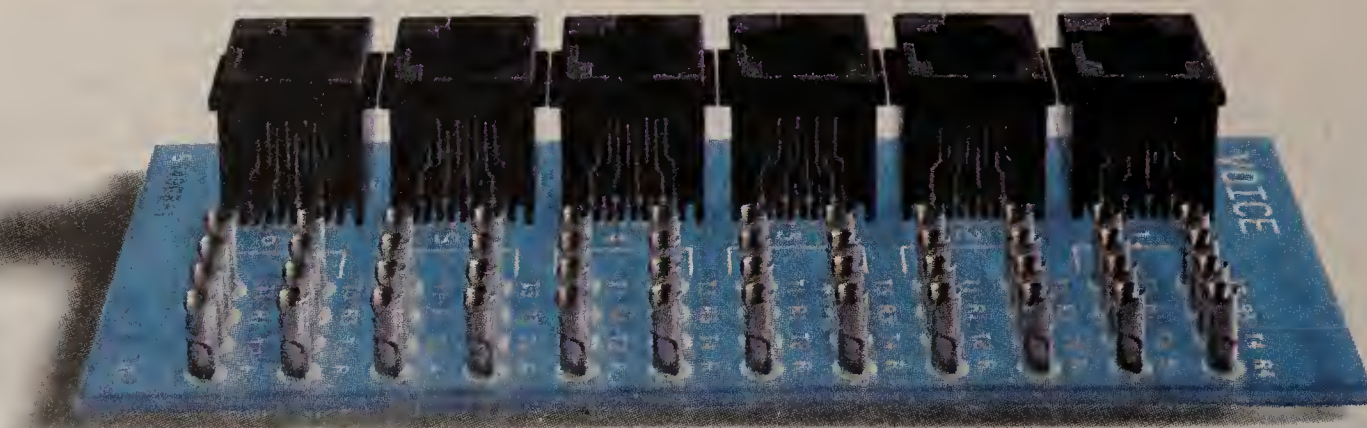
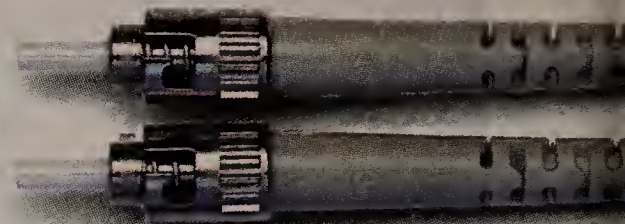
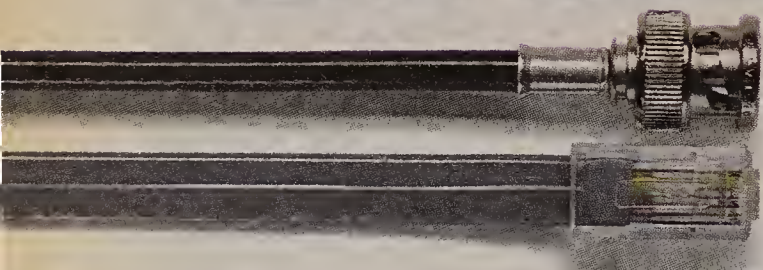
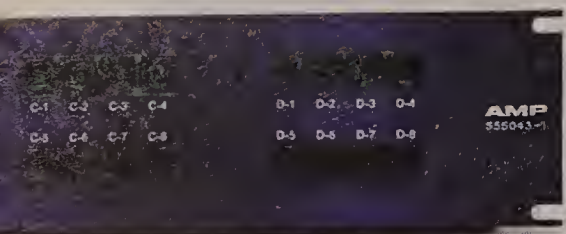
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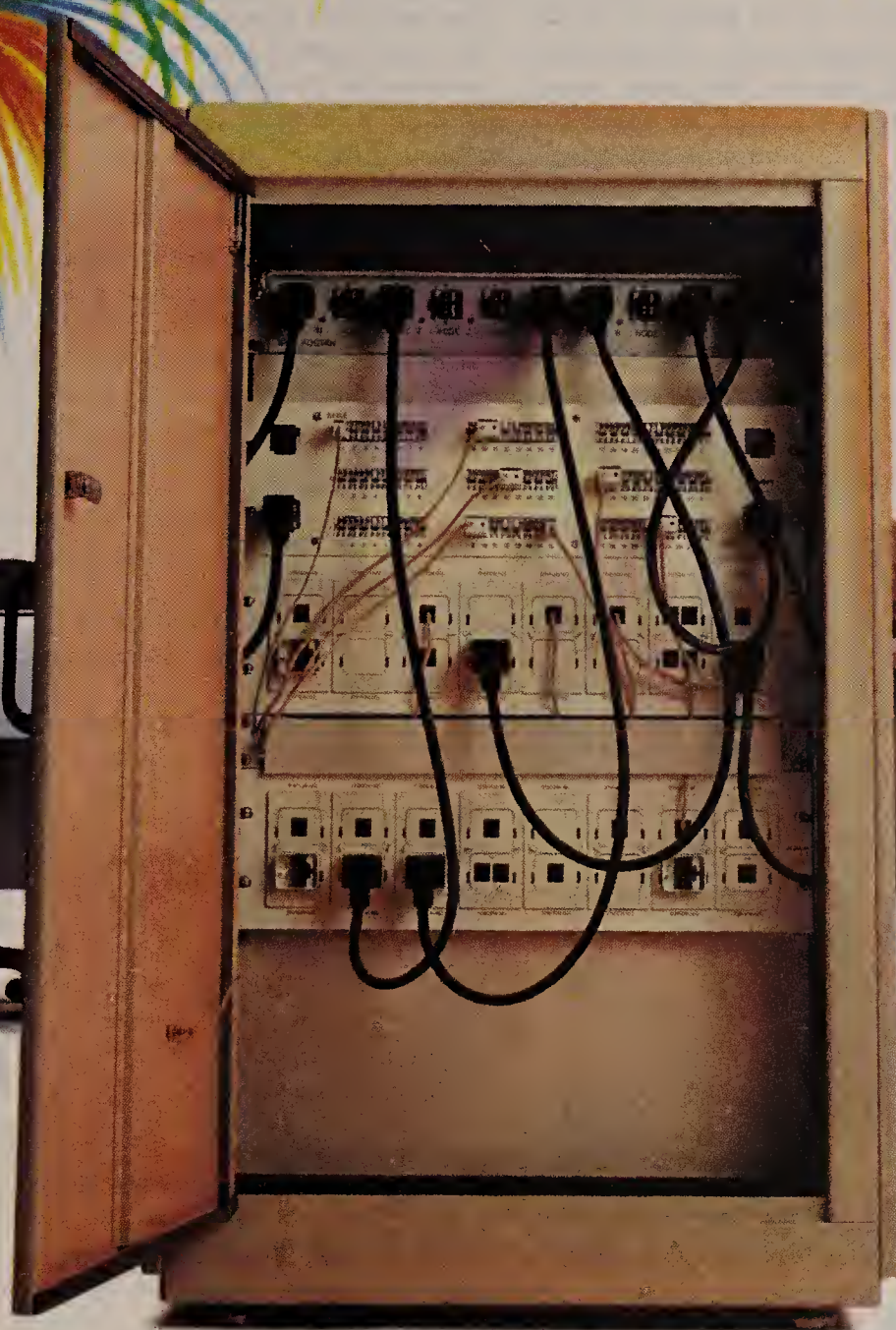
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AMP

RBHCs try to thwart high court decision

continued from page 17

out competition and subsidize the new ventures with money from ratepayers.

The RBHCs, in their brief to the Supreme Court, denied they would act improperly and asked the court to reject the appeal. They pointed to a recommendation from the U.S. Department of Justice, the agency that brought the original anti-trust suit against AT&T. That recommendation says the RBHCs should be allowed to provide information services.

The Justice Department concluded that there is no substantial evidence to show that the RBHCs would or could act anti-competitively if they were allowed to enter

the information business.

Additionally, the RBHCs argue that they should be allowed to offer information services because none of the primary parties

the heart of the lower court's reversal of Greene's decision.

The lower court said Greene should have used a less stringent legal standard to

service and manufacturing since both of those business areas have been hotly contested.

The RBHCs also said the Supreme Court should refuse to hear the appeal since there are still proceedings under way to decide the fate of the information services restriction.

In overturning Greene's decision on information services, the lower court said there was a possibility that Greene could have reached the same decision using the correct legal standard and sent the case back to him for reconsideration.

The RBHCs have filed a motion with Greene asking him to lift the information services restriction during that review. Opponents will be allowed to file comments next month. **■**

The RBHCs, in their brief to the Superior Court, denied they would act improperly and asked the court to reject the appeal.

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to the Consent Decree — AT&T, the Justice Department and the RBHCs — or the Federal Communications Commission contested the request. This point was at

evaluate RBHC entry into information services since that activity was uncontested. The court upheld Greene's decision to maintain the restriction on long-distance



UDS V.32 Modems: winners at 19.2 kbps—now FastTalk doubles the speed

From the day of its introduction, UDS' V.32 modem has gathered honors from leading computer publications and other industry watchers!

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For accurate communication over

worst-case lines, the unit incorporates V.42 LAP-M and MNP 4 error control functions. A full complement of on-board test functions is included, and eight LEDs provide easy monitoring of the unit's operation and built-in diagnostic features.

Get acquainted with the latest winner in the UDS V.32 family. For technical details and quantity pricing, contact UDS, 5000 Bradford Drive, Huntsville, AL 35805-1993. Telephone 205/430-8000; FAX 205/430-8926.



See The FAXNet Form on Page 62

FTS 2000 users, AT&T eye user group

continued from page 17

GSA is pushing AT&T to make it more widely available.

Jim Dollezel, chief of the telecommunications system division for the Department of the Interior, said billing errors exist that both AT&T and the GSA have so far failed to address.

During the past six months, the Interior Department has analyzed the call detail records for more than 40,000 numbers on

Jim Dollezel of the Department of the Interior said errors exist that both AT&T and the GSA have so far failed to address.

▲▲▲

its account and has determined that a portion of those numbers belong to other agencies, according to Dollezel.

During the transition, the GSA has continued the old method of billing in which it takes the total monthly network bill received by AT&T and charges agencies an averaged percentage of the bill, not on a per-call basis.

As the new fiscal year begins on Oct. 1, the GSA will begin the transition to per-call billing. Dollezel said he wants to see the errors corrected before the Interior Department is erroneously billed.

GSA, the central authority for billing changes, will have to work with AT&T to sort out the problems. But AT&T and GSA said a net with 800,000 users requires patience and cooperation on a large scale. **■**

Washington Update

continued from page 17

AT&T amid legal questions.

Two deals, one for La Quinta Motor Inns, Inc. and a second for two customers — Shawmut Bank, N.A. and CBS, Inc. — are under suspension while the FCC investigates their legality.

Those deals do not include the reimbursement provisions that led to the rejection of the two deals earlier this month. However, CBS and Shawmut have decided to purchase service from MCI Communications Corp. rather than wait for a resolution to the Tariff 15 suspensions. **■**

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DATA COMMUNICATIONS

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Worth Noting

"Forty-five percent of our clients have greater than 50% data on their networks. Twenty percent of our clients have data only, without voice."

Karyn Mashima
Vice-president, corporate marketing
Network Equipment Technologies, Inc.
Redwood City, Calif.

Data Packets

CrossComm Corp. last week became the latest vendor to announce support for a frame relay interface to **StrataCom, Inc.**'s IPX FastPacket T-1 multiplexer. CrossComm announced its intention to develop the frame relay interface for its ILAN Internetwork Server product family, which consists of offerings that link Ethernet and token-ring local-area networks using a range of wide-area network transmission services.

J2 Software Labs, Inc. recently released a technical report that provides an evaluation of nine DOS-based IBM 3270 Systems Network Architecture gateway products.

The report evaluates gateways from Attachmate Corp., Data Interface Systems Corp., Digital Communications Associates, Inc., Eicon Technology Corp., IBM, Novell, Inc., Network Software Associates, Inc., Rabbit Software Corp. and 3Com Corp.

"J2 Reports on SNA Gateways" evaluates the products based on features such as comprehensiveness, pricing, gateway-to-host access features, manageability and security.

The 75-page report costs \$145 but can be purchased at an introductory rate of \$95 until Oct. 15. Quantity discounts are also available.

For more information, contact J2 Software at 115C Southampton Lane, Santa Cruz, Calif. 95062; (408) 429-8449. Orders can be faxed to (408) 429-8492. ■

FEDEX ITC to install Netrix switches to ease net control

User will diagnose, repair faults from central site.

By Paul Desmond
Senior Editor

MEMPHIS, Tenn. — FEDEX International Transmission Corp. (ITC) last week announced it has signed Netrix Corp. to supply it with circuit/packet switches that promise to ease net management for the high-speed public network provider.

The new equipment will enable FEDEX ITC, a subsidiary of Federal Express Corp., to diagnose and repair user equipment problems from a central data center instead of dispatching a field engineer to the user's location.

FEDEX ITC cited the equipment's management capabilities and its promised support for a frame relay interface as reasons for choosing the Netrix #1-ISS integrated circuit/packet switch T-1 multiplexer.

FEDEX ITC was formed in 1983 to support Federal Express' ill-fated ZapMail, a Group IV facsimile service that eventually fizzled, said Gary Ragsdale, assistant vice-president and chief engineer for FEDEX ITC.

Today, FEDEX ITC runs the FEDEX Network, which supports global voice and data communications for its parent company and a public packet network service targeted at high-volume X.25 users. The new Netrix #1-ISS switches will support those packet users and free up Tandem Computers, Inc. processors, which were tailored to function as packet switches, to support

new value-added services such as X.400-based electronic mail and electronic data interchange.

The #1-ISSs will work in conjunction with existing Network Equipment Technologies, Inc. Integrated Digital Network Exchange (IDNX) multiplexers, which are used to support FEDEX Network's mesh-topology T-1 voice and data backbone.

Users will link their computers to a #1-ISS at one of 28 domestic locations, and the #1-ISS will in turn link to the IDNX. The two switches will be collocated in some cases but will have a leased line between them in other cases, Ragsdale said.

The #1-ISS supports an X.25 interface, which will be the user access protocol. But it also supports circuit switching and can dynamically alternate any connection between circuit and packet mode, which is the key to giving FEDEX ITC centralized control over user equipment.

If a customer has a transmission problem, FEDEX ITC will be able to transfer the X.25 link at the user's site to a circuit-switched link and, with a few keystrokes on the #1-ISS management console, route that circuit to the FEDEX ITC net control center here.

Engineers with data scopes can then examine the data stream to determine the problem and reconfigure the remote equipment accordingly.

(continued on page 26)

Videotex service speeds firm's claims processing

By Tom Smith
New Products Editor

WASHINGTON, D.C. — An international health reinsurance provider here recently said videotex services have enabled it to slash communications costs and provide near-immediate access to critical information.

The International Division of Group Hospitalization and Medical Services, Inc. (GHMSI) has significantly expanded its use of videotex services globally to support health claims processing and is considering using the service to support more advanced applications.

"The primary factor [in videotex implementation] was having a workable, cost-effective solution to serve our clients better," said

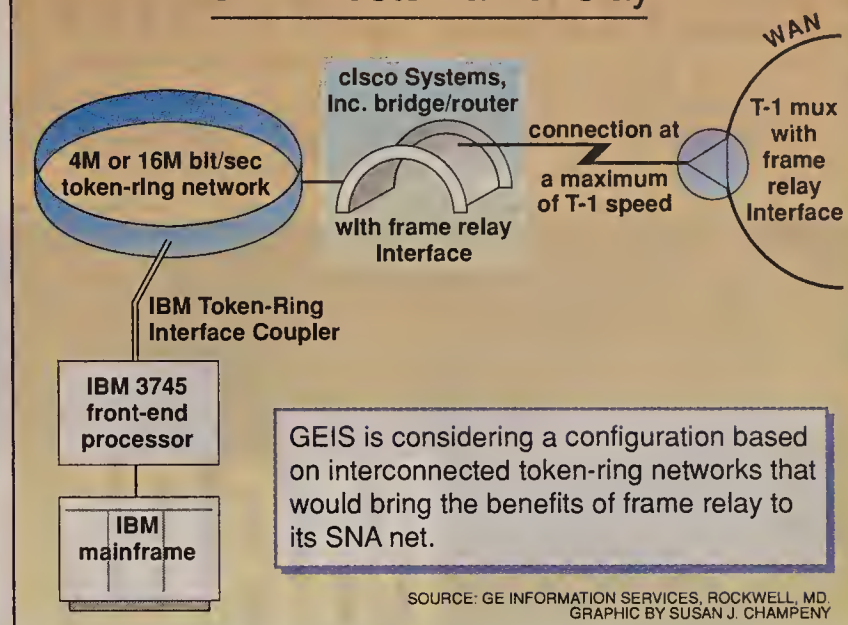
Jacquelyn Hartley, project manager for the European department at GHMSI. "And it certainly seems to hold a lot of promise for us in new potential applications," including sales presentations and access to financial data.

As a reinsurance provider, GHMSI's International Division services health insurance accounts sold by subsidiaries and business partners. The company has used videotex services since late 1989 to support a data access application in which hospitals can gain access to insurance benefits eligibility data for non-citizens filing medical claims.

Videotex is used at service centers in two locations here, two in the U.K., one in France and one in

(continued on page 93)

SNA meets frame relay



GEIS to boost SNA net with frame relay

Company will improve response time by installing StrataCom frame relay muxes to link token rings.

By Paul Desmond
Senior Editor

ROCKVILLE, Md. — GE Information Services (GEIS) last week announced it is planning to improve the performance of its SNA backbone by installing StrataCom, Inc. T-1 multiplexers that support a frame relay interface.

The enhancements to GEIS' public data net will improve response time for the company's users and will be the foundation on which GEIS will build future capabilities, including higher user access speeds, possibly through the introduction of a frame relay service.

Frame relay promises to improve the performance of GEIS' Systems Network Architecture net by letting the company use frame relay-compatible bridge/routers and StrataCom's IPX FastPacket T-1 multiplexers to connect token-ring networks that, in turn, support IBM front-end processors.

Analysts said that's a strategy that could provide performance benefits for any user's SNA net.

The strategy will also position GEIS to offer a frame relay service at some point, although Jim Keough, GEIS' manager of network engineering, said the company has not decided whether it will do so.

Keough said GEIS hasn't decided about such a service yet because it would be a fundamental shift for the company, which typically provides applications such as electronic data interchange, electronic mail, order entry and financial management reporting services but does not emphasize data transport services.

GEIS uses IBM and NEC Corp.

mainframes to support the applications. The mainframes use IBM 3745 front-end processors located in eight U.S. locations plus two in Europe. There will soon be three in the Far East as well.

Users have a number of options for how to access the 3745s, including X.25 and IBM 3270 sessions.

"The primary benefit [of the new configuration] will be the ability to support higher performance user profiles. That is, faster and more responsive data transport for users," Keough said.

The enhancements to GEIS' public data net will improve response time for GEIS users.

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He said the new IPX switches, which he expects to be installed in mid-1991, will replace backbone packet switches GEIS designed itself in the early 1980s by adapting a process control unit made by Honeywell, Inc.'s Industrial Automation Systems Division. He said those switches are reliable but will not support the higher user speeds GEIS customers will require.

"We need something that will carry us into the year 2000," Keough said. "We believe frame relay is the right technology."

Although GEIS has not yet

(continued on page 26)

GEIS to boost SNA net

continued from page 25

firmed up its strategy for linking its SNA mainframes to the network, he said the leading candidate for the job is a configuration whereby each IBM 3745 front-end processor will be connected via an IBM Token-Ring Interface Coupler to a token-ring local-

area network.

Bridge/routers from cisco Systems, Inc., outfitted with a frame relay interface that is compatible with the frame relay interface on the IPX, will also reside on the token ring (see graphic, page 25).

Previously, cisco Systems announced its bridge/routers would support StrataCom's implementation of frame relay.

Today, a number of users are employing token-ring nets to interconnect multiple cluster controllers at the same site or to support cluster controller links to front-end processors ("Users turn to token-ring LANs to network IBM FEPs," *NW*, Aug. 13).

Although the token-ring LAN supports speeds of at least 4M bit/sec, that speed is typically forced to choke down to 56K bit/sec

when the LAN is bridged to another token-ring across a wide-area network because that is the maximum speed that most routers and bridges support.

Frame relay promises to change that by giving devices such as cisco Systems' bridge/router access to the entire backbone bandwidth — up to 1.544M bit/sec T-1 speeds — when used with a fast packet T-1 multiplexer

such as StrataCom's.

Used with a circuit-switched multiplexer, the bridge/router would be able to access whatever bandwidth users choose to allocate to it ("Timeplex muxes to support frame relay," *NW*, Sept. 17).

Analysts said the topology GEIS is considering is one that could provide performance benefits for any SNA network.

"You'd tend to run closer to LAN speeds rather than wide-area network speeds," said David Passmore, a partner at Ernst &

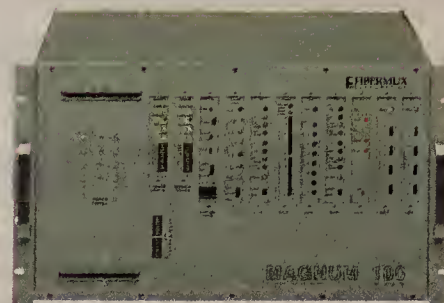
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The topology GEIS is considering could provide benefits for any SNA net.



Young's Network Strategies, Inc., a consultancy in Fairfax, Va. "The kind of performance you would see would be analogous to what you would see if everybody was on one LAN, which is what it looks like to the end nodes."

But Passmore noted that the configuration requires that token-ring LANs be used at each of the wide-area connections because the strategy relies on a bridge or router supporting frame relay. "Whatever you've got at one end, you've got to have at the other end," he said. ■

Firm to install Netrix switches

continued from page 25

Previously, if a user had trouble transmitting data, FEDEX ITC would have to dispatch a field engineer to the customer's location to resolve the problem.

"Many of our customers have no experience with packet switching," Ragsdale said. "It eliminates the perception that the service is difficult to use if we don't have to send engineers."

Also, the #1-ISS uses X.25 links to support the transmission of all net management data. That's important in terms of managing #1-ISS switches installed in Europe, which are linked to the U.S. network via public packet nets. But since the #1-ISS management data uses X.25, FEDEX ITC is able to manage those switches from its control center here, Ragsdale said.

Netrix has promised to offer a frame relay interface for the #1-ISS and expects FEDEX ITC to be among its early users when the interface becomes available in the first half of 1991. That will allow FEDEX ITC to offer frame relay support of a link to the backbone at T-1 speeds for those users with compatible bridge or router products, Ragsdale said. ■

LOCAL NETWORKING

PC AND TERMINAL-TO-HOST LANS, GATEWAYS AND MICRO COMMUNICATIONS PRODUCTS

Worth Noting

“The controversy about performance problems of 16M bit/sec token-ring adapters and the Texas Instruments, Inc. Falcon chip has caused a crisis of faith among some users. Proteon [Inc.] didn't lose any sales, but we did see some users delaying orders until now.”

Patrick Courtin
President
Proteon, Inc.
Westborough, Mass.

Netnotes

Cheyenne Software, Inc. recently introduced its ARCserve automated tape backup software, which enables network administrators to perform unattended backup of Novell, Inc. NetWare 386 local-area networks from a central location.

ARCserve runs as a NetWare Loadable Module (NLM) application in a NetWare 386 file server and is the first NetWare 386 backup package to ship as an NLM, according to Lisa Merkin, Cheyenne's director of marketing.

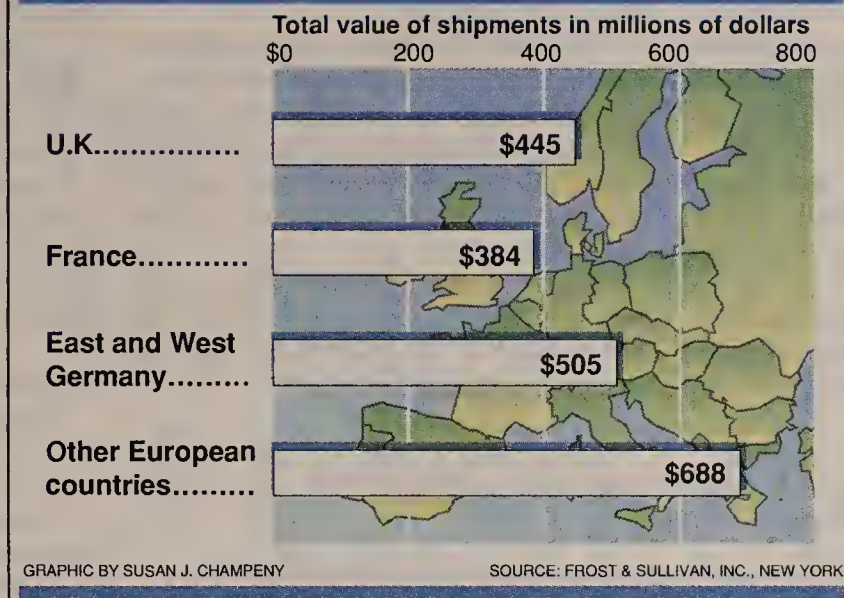
The ARCserve NLM enables net administrators to perform unattended, continuous file services for both NetWare 386 file servers and networked personal computers.

File server data moves directly to tape without affecting network traffic, Merkin said. ARCserve also allows network administrators to perform unattended backup of networked personal computer files by scheduling each personal computer for backup at any time of the day or night, regardless of whether the workstation is being used to perform other tasks.

ARCserve is available in two configurations. The ARCserve for 386, which is used for archiving to direct access devices, costs \$85. The second

(continued on page 30)

LAN forecast in Europe



3Com's LAN Manager 2.0 has menus, lite NETBIOS

Firm says new version is compatible with 1.1.

By Laura DiDio
Senior Editor

SANTA CLARA, Calif. — 3Com Corp. said it will begin shipping this week Version 2.0 of Microsoft Corp.'s LAN Manager containing 3Com's menu services and a lite version of IBM's Network Basic I/O System.

3Com — codeveloper of the original LAN Manager — said the new version of 3+Open will be interoperable with Version 1.1 of 3+Open. 3+Open LAN Manager 2.0 will come packaged with 3+Open Menus and 3+Open

is incapable of running a compute- and memory-intensive computer-aided design and manufacturing application, and will not display that item as a menu option on the DOS user's screen, Kessler said.

“This is also helpful to network administrators because it means they don't have to build unique menus for each user on the network,” Kessler said. “It saves them a lot of time and headaches by simplifying the workstation configuration process.”

Kessler said 3+Open Menus is designed specifically for DOS workstation users since users with workstations running OS/2 already have similar features and functionality in Presentation Manager, which is part of OS/2.

The second bundled feature is 3+Open NPB, a lite version of the NETBIOS protocol stack. The NPB facility leaves 525K bytes of RAM available for other uses in a workstation with a standard 640K bytes of random-access memory.

“This saves users between 15K and 20K bytes of RAM over what's currently available in the standard version of NETBIOS provided in other versions of Microsoft's LAN Manager,” Kessler said. “We're also packaging the standard version of Microsoft's JETBEUI in 3+Open 2.0,” he added.

“We think 3+Open LAN Manager 2.0 will show slow but steady growth. It's a new system; users still have to evaluate it, our resellers have to learn how to support it, and it needs to be field-proven before it catches on,” Kessler said.

“We're continuing to sell 3+Open LAN Manager 1.1 at a

(continued on page 30)

Kessler said 3+Open Menus is designed specifically for DOS workstation users.

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NETBIOS Protocol (NPB).

The 3+Open Menus utility, which was codeveloped with Sabre Software, Inc., runs on MS-DOS microcomputers and simplifies user access to applications, network resources and DOS commands, according to Alan Kessler, vice-president and manager of 3Com's Distributed Systems Division.

Besides simplifying the user interface, 3+Open Menus checks the local system hardware to verify that the application or service requested across the network can be supported by the workstation.

The 3+Open Menus will know, for instance, that a standard 640K-byte DOS workstation

Codenoll, GM ready cheap plastic fiber

Companies say low-cost optical technology to compete with shielded, unshielded twisted pair.

By Laura DiDio
Senior Editor

DALLAS — Codenoll Technology Corp. and the Packard Division of General Motors Corp. said at the recent NetWorld '90 trade show they will deliver by year end plastic optical fiber devices that bring the cost of attaching a single workstation to an Ethernet net to less than \$1 per foot.

GM's Packard Division will manufacture plastic optical components for use in automobiles, while Codenoll will sell its products, including connectors and switches, to commercial end users, said Brian Ramsey, Codenoll's director of marketing.

The two companies demonstrated the Plastic Optical Fiber (POF) technology supporting 10M bit/sec Ethernet, 100M bit/sec Fiber Distributed Data Interface, and 150M and 300M bit/sec metropolitan-area nets at a press conference at NetWorld here.

Executives from the companies said the low-cost POF technology, which the two firms jointly developed during the last six years, is targeted as direct competition for shielded and unshielded twisted-pair wire and not glass-based fiber-optic cable.

“We see it competing with [shielded twisted pair] and [unshielded twisted pair] as the premier media for departmental local-area network connections at maximum distances of 330 feet from the wiring closet to the workstation,” Ramsey said.

“We're not obsoleting glass as a long-distance data transmission medium,” he said, adding that his firm thinks “62.5-micron glass fiber cable will still be the dominant connection medium for extremely high data transmission rates across longer distances.”

The standard 62.5-micron glass fiber, which is about three times more expensive than POF and twisted-pair cable, is typically used for backbone LANs in campus networks and can support a maximum distance of 1½ miles, Ramsey said.

Ramsey and Codenoll President Michael Coden said the cost of POF fiber will be roughly equivalent to the price of unshielded twisted-pair wire. POF cable currently costs about 10 to 15 cents per foot, while dual-pair unshielded twisted-pair wire is about 14 cents a foot, and shielded twisted-pair cable prices are

(continued on page 28)

Madge conquers 4M/16M adapter jitter problems

DALLAS — Madge Networks, Ltd. said at the recent NetWorld '90 show here it has overcome the problems that caused the company to suspend shipments of its 4M/16M bit/sec token-ring adapters last June and will resume shipments of the boards later this fall.

Madge Networks was forced to recall nearly 1,000 of its Smart 4M/16M bit/sec Ringnode adapters after a customer complained of excessive data errors in a 30-node token-ring network.

At the time, Madge Networks President Robert Madge attributed the problem to jitter caused by a design flaw in Texas Instruments, Inc.'s Falcon token-ring chip.

But later, Madge admitted that his company shared in the blame since it had not bothered to test its 4M/16M bit/sec adapters in networks of more than 15 nodes (“Madge Networks recalls faulty

token-ring adapters,” NW, July 2).

TI steadfastly maintains that the chip meets all of the specifications of the 802.5 standard but admits that the Falcon is sensitive to board components.

Testing was key

Other vendors that use TI's Falcon chip, such as Olicom USA in Plano, Texas, did not experience the problems Madge had because they tested their adapters more thoroughly and added extra filter circuitry to avoid the jitter problem.

Madge has now followed suit. The company said it will continue to use TI's chipset and that it has also added an inductor-based filter circuit to the Madge Smart 16/4 Ringnode adapters, a move suggested to TI by Proteon, Inc. Chairman Howard Salwen, according to Ed Murray, director of

(continued on page 28)

Madge conquers jitter problems

continued from page 27

North American operations for Madge.

"The inductor-based filter combined with the new version of the Falcon chip, which has been designed to minimize the effects of jitter caused by changes in data patterns, will enable us to resume shipments of our 4M/16M bit/sec token-ring adapters," Murray said.

"We're finishing the testing now and we can assure our customers that jitter will no longer be a problem," he added.

Madge said its Smart 16/4 AT Ringnode and EISA Ringnode interfaces with the new circuitry will now support the 802.5 specification of a maximum of 260 nodes on a

single token-ring LAN with a maximum distance of 330 feet between wiring concentrators and workstations and will be fully interoperable with IBM token-ring adapters.

Not jitterbuster

Madge emphasized, however, that its inductor-based filter circuit is not related to the new jitterbuster technology jointly announced at NetWorld '90 by Proteon and TI.

The jitterbuster, which will be marketed and licensed by TI, will initially be sold as an add-on option to the TI chipset and will be available in November.

TI has not announced specific pricing or packaging for the jitterbuster circuitry.

TI and Proteon are proposing that the

jitterbuster technology be incorporated as part of the IEEE 802.5 standard.

Madge's Murray said, however, that his company is opposed to the inclusion of the jitterbuster technology into the standard on the grounds that "it's fundamentally at odds with the basic concept behind the IEEE 802.5 standard."

"We think it's a bad solution to a problem that has already been solved by the inductor-based filter circuit Proteon itself developed and the improved version of the Falcon chip. We don't understand why Proteon is promoting the jitterbuster technology," Murray said.

Whatever option the IEEE 802.5 committee eventually adopts, token-ring vendors seemed to have licked the once-elusive jitter problem. **■**

Codenoll, GM ready cheap plastic fiber

continued from page 27

currently at about 60 cents per foot.

The Codenoll executives also noted that POF cable offers users the advantages of glass fibers.

"Unlike twisted pair and coaxial wire, which use electrical signals to transmit data across networks, POF is a light-based transmission medium that is immune to electromagnetic interference and vibrations so it can be installed near copy machines, X-ray units and elevator shafts, and still deliver reliable, error-free data transmissions," Ramsey said.

Network on wheels

The idea of developing plastic optical technology came from GM, which approached Codenoll about six years ago to develop plastic optical capabilities for data transmission within an automobile.

GM was looking for a reliable, inexpensive data transmission medium that would solve the ongoing problem of electromagnetic interference generated by the six to 50 processors that are installed in today's cars.

Automobiles use 10K bit/sec unshielded twisted-pair wire to transfer data among processors. But Bill Collins, manager of specialty products at GM's Packard Electric Division, said the next generation of computer-dependent cars will require a

The idea of developing plastic optical technology came from GM, which approached Codenoll about six years ago.

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fivefold increase in data transmission speed, up to 50K bit/sec.

GM experiments with shielded twisted-pair wire revealed that it was too susceptible to electric noise generated by objects such as spark plugs, radio speakers and headlight relays to successfully achieve reliable data transfer rates of 50K bit/sec. The only answer was fiber, but at nearly 40 cents a foot, glass fiber was too expensive.

"Glass is much more expensive, and pennies count in automotive applications," Ramsey said. "So GM and Codenoll worked together to get all of the bugs out of plastic fiber to come up with a reliable, low-cost alternative."

The first product from the joint Codenoll/GM development efforts will be a connector system consisting of connectors, wall plates, patch panels, cables and test equipment for the plastic fibers. Codenoll did not give specific pricing or delivery dates other than to say the products will ship in volume by the fourth quarter.

The POF products will be able to support Ethernet, FDDI or metropolitan-area networks by switching network adapters, Ramsey said.

Codenoll and GM said they will license the technology for the connectors, electrical parts and chips to other companies. Additionally, the two companies said they plan to propose the POF technology to the 802.3 10BaseF committee at its November meeting as an alternative to 62.5-micron glass. **■**

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Netnotes

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version, ARCserve+ Tape for 386, supports Small Computer System Interface or QIC.02 tape-drive backups on either an IBM Personal Computer AT or Micro Channel bus-based server.

Both configurations of ARCserve are available now.

For more information, contact Cheyenne Software at 55 Bryant Ave., Roslyn, New York 11576, or call (516) 484-5110.

U.S. Sage, Inc. last week introduced a 10M bit/sec Ethernet interface for the new IBM Personal System/1 home computer. The 8-bit board, called MainLan for PS/1, enables users to share file and print ser-

vices on an Ethernet local-area network.

MainLan for PS/1 is available as part of a complete starter pack or as a separate card. The starter pack includes two 10M bit/sec Ethernet boards for the PS/1, as well as MainLan peer-to-peer operating system software, which is compatible with the IBM Network Basic I/O system and Novell, Inc. NetWare. The starter pack is priced at \$499.

Purchased separately, MainLan PS/1 Ethernet cards with Novell drivers cost \$199 each. The MainLan Version 3.12 peer-to-peer operating system software for an unlimited number of users is priced at \$199.

Users that want to network PS/1 in a file server environment may use the same cards with U.S. Sage's MainLan 386 net-

work operating system. MainLan 386 costs \$599 for a two- to four-user license, \$999 for as many as eight users and \$1,499 for an unlimited-user license. MainLan for PS/1 is expected to ship in October.

U.S. Sage can be reached by writing to 2005 Tree Fork Lane, Suite 113, Longwood, Fla. 32750, or by calling (407) 331-4400.

Persoft, Inc. recently introduced the first bridge in a new family of products. The Intersect LAN Bridge is a low-cost learning bridge that links two local Ethernet.

Persoft's Intersect LAN Bridge consists of software and Ethernet boards that plug into any IBM Personal Computer or compatible. The bridge is available now and

sells for \$1,495.

For more information, write to Persoft at 465 Science Drive, Madison, Wis. 53711, or call (608) 273-6000.

Advanced Concepts, Inc. has released Version 1.11 of its Office Minder groupware software for Novell, Inc. NetWare nets. The initial version of Office Minder included telephone message scheduling, resource management and electronic mail based on the Novell Message Handling System. The latest version has been upgraded to include message folders for organizing mail, on-line help and a facsimile gateway interface to FACSys, a local-area network fax product developed by Opus Software Corp.

Office Minder is available now and costs \$895 per file server.

For more information, write to Advanced Concepts at 4129 N. Port Washington Ave., Milwaukee, Wis. 53212, or call (414) 963-0999.

Bytex Corp. last week cut \$1,000 off the price of its Bytex ATS 1000 local-area network protocol analyzer.

Effective immediately, the ATS 1000 now sells for \$16,995, down from \$17,995. The base ATS 1000 system comes with a portable microcomputer with a detachable keyboard and monitor, an Ethernet network interface, system software and ATS 1000 software containing predefined data collection and statistical analysis network management software.

The company also said it will sell the ATS 1000 without the keyboard or monitor for \$13,995.

Bytex Corp. is located at Southborough Office Park, 120 Turnpike Road, Southborough, Mass. 01772; (508) 480-0840.

Fujitsu, Ltd. in Tokyo recently said it is developing a mixed vaccine that reportedly can kill 50 different types of computer viruses. It plans to sell the package within a year for the same price as a floppy diskette, plus postage. The vaccine is for MS-DOS-based personal computers. Fujitsu developed the virus because it has had problems with the potent Friday the 13th virus. □

3Com LAN Mgr. 2.0 has menus, NETBIOS

continued from page 27

fast pace. We've already sold tens of thousands of copies and have an installed base of about 300,000 users," Kessler said.

The 3+ Open LAN manager Version 2.0 Server Pak for five users includes 3+ Open Menus and NBP, and it costs \$995. Additional 10-user licenses cost \$995, while an unlimited-user package is available for \$6,490.

Upgrade program

3Com also announced its Technology Upgrade Program, a migration package to enable current 3+ Open Version 1.1 users to save up to 23% if they upgrade to 3+ Open Version 2.0 before September 1991, Kessler said.

Users can upgrade from 3+ Open LAN Manager Version 1.1 Entry System to 3+ Open 2.0 for \$595; an upgrade from 3+ Open Version 1.1 Entry System to a 15-user 3+ Open Version 2.0 package costs \$795. Users wanting to migrate from 3+ Open LAN Version 1.1 Advanced System to 3+ Open Version 2.0 unlimited-user Server Pak can do so for \$995. □



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MANAGEMENT STRATEGIES

MANAGING PEOPLE AND TECHNOLOGY: USERS GROUPS AND ASSOCIATIONS

Dialogue

The newly formed User Alliance for Open Systems — formerly the Houston 30 — recently asserted that users share the blame with vendors for the slow deployment of open systems. Do you agree?

“I don't think users have been shown enough products to buy into. Users want open systems, but vendors have to take the initiative and build products to specific standards that everyone follows.”

“The problem is that vendors still want to compete using their proprietary systems. Open systems levels the playing field, taking away vendors' advantages.”

George Tabback
Director of corporate information systems
Ingersoll-Rand Co.
Woodcliff, N.J.

“If vendors saw that users had a strong desire to implement open systems, they would develop the right products.”

“A lot of users talk about open systems, but most don't really put in the time and effort to push vendors into developing the products they want. Most users are content to let vendors come up with standards instead of getting involved in the process themselves.”

Jeff Hafer
Telecommunications manager
General Public Utilities Service Corp.
Reading, Pa.

“Users have not pushed vendors hard enough to develop open systems, so in essence, we are guilty.”

“If users really wanted open systems, vendors would provide them — no question about it. But as long as people say they want open systems and their buying habits speak otherwise, we won't see much progress.”

Chuck McCaig
Senior vice-president of corporate services
Mutual Benefit Life Insurance Co.
Newark, N.J.

Network World invites users to respond to future “Dialogue” questions through our Bulletin Board System (BBS). For information on how to access the BBS, see the Table of Contents on page 2.

Benchmarkers help users keep IS expenses in line

Consultants measure data costs against the norm.

By Maureen Molloy
Staff Writer

Users trying to get a grip on information systems (IS) costs are increasingly turning to companies that provide benchmark services in an effort to find out if their data centers are cost effective and productive.

Benchmark consultants — also known as metrics providers — gauge data center costs and compare them with the IS costs of other firms, providing a way to rise above the usual cost-accounting mechanisms, according to Chuck Mallet, an independent consultant.

Mallet, formerly senior vice-president and chief information officer at Chicago-based Heller Financial, Inc., a subsidiary of Japan's The Fuji Bank, Ltd., said the popularity of such comparative measures has been spurred by the new interest in outsourcing and downsizing.

“The climate out there today is one where top management thinks data center costs are too high so they're starting to look at outsourcing as an option,” he said. “But before you can make a decision like that, you need to know how much your data center is costing you in real terms.”

Two years ago, when Heller's IS department became a candi-

date for outsourcing, Mallet hired Compass Holdings BD, a Scandinavian metrics provider that recently entered the U.S. market.

Compass' results showed that Heller Financial's 40-person data center, which took about \$5.5 million a year to run, was costing the company 30% less than the data center costs of the average company in the industry.

“The department's internal costs were lower than all three of the outsourcing bids we received so we decided not to outsource,” said Mallet, who noted that the results gave the IS workers a needed morale booster and earned them greater respect from the executive suite.

Mallet said he chose little-known Compass over one of the Big Six accounting firms because he thought it provided a more objective and detailed method for assessing costs, which Mallet said he preferred over the theoretical benchmark provided by Big Six firms.

Compass was created in the early 1980s by Thomas Blitz, a former consultant with Swedish carmaker AB Volvo. In its analysis of a corporate data center, Compass extracts three kinds of data: capacity of and load on the mainframe, IS personnel infor-

(continued on page 32)



Ron Kopitowsky



PHOTOS ©1990 STEVEN BORNS
Charles Murray

CMA chiefs discuss group's goals, plans

New leaders of the organization also talk about the challenges facing net managers in the '90s.

Q&A For more than 40 years, the Communications Managers Association (CMA) has been serving the needs of network managers in large firms headquartered primarily in and around the New York metropolitan area.

Composed of more than 220 member companies, CMA is preparing for its annual conference and exhibition, which will take place Oct. 21 to 24 at the New York Hilton.

The users group also recently elected a new slate of leaders, including President Ron Kopitowsky, director of telecommunications at the Metropolitan Transportation Authority in New York, and First Vice-President Charles Murray, director of telecommunications at The Travelers Corp. in Hartford, Conn.

In an interview with Network World last week, Kopitowsky and Murray outlined their goals for CMA, which include establishing closer ties with the academic community and other communications associations in the New York area. They also discussed the challenges facing network managers in the 1990s, including outsourcing, decentralized computing, the rapid pace of technological change and regulatory issues.

What major initiatives are you planning for CMA?

Kopitowsky: For one, we would like to foster closer ties with the academic community. There are between six and 12 academic programs devoted to tele-

communications in this region, but nobody has ever put together a comprehensive list of all of them and what they offer. We would like to showcase these programs at our conference and in our newsletter.

We're also very excited about our Executive Day program on Nov. 14. The daylong seminar will feature well-known speakers discussing current trends and issues in networking. It will also allow time for senior executives and their communications managers to sit down together and discuss network strategies and issues they need to address.

These days, do senior executives view communications as a cost of doing business or as a way to achieve a competitive advantage?

Kopitowsky: Many senior executives understand and support the idea of using communications for competitive advantage and have been successful at it. Executives are also cognizant that communications costs are rising faster than profits in most industries. In this environment, the emphasis is on cost cutting rather than using communications for competitive advantage.

Murray: Many communications managers are finding they have to choose between hiring new staff and implementing value-added technology such as [automatic call distributors] or electronic mail.

Would you say that cost-conscious senior executives are driving the current interest in outsourcing?

(continued on page 91)

EXECUTIVE BRIEFS

BY WAYNE ECKERSON

U.S. executives work at a faster pace. According to a recent survey of 200 U.S. and British executives, 51% of the executives surveyed in Great Britain think the work pace in the U.S. is faster than that maintained by executives in their own country.

The survey was sponsored by Robert Half International, Inc., a recruitment company specializing in information systems, accounting and banking.

Nearly two-thirds of the U.S. executives surveyed said they found the pace of work in the U.S. faster than the pace in England.

We'll mind your meeting. Covia Partnership recently announced Premier Meetings, a new consulting service that helps businesses plan, implement and manage corporate meetings. Premier Service consultants will help companies set meeting objectives, select appropriate sites, arrange for audiovisual support and even run the meeting, if necessary.

Better known for its Apollo computer reservation system, Covia is marketing Premier Meetings primarily through travel agencies.

Covia will charge businesses directly for using the Premier Meetings service but will not book flights or hotel reservations. That service will be offered through the travel agencies that market the service. □

Benchmarkers help users keep IS in line

continued from page 31

mation and financial information such as capital investment and operating costs.

The firm then determines the actual costs and benefits of data center production through a total of 900 measurement points, including everything from CPU downtime to the cost of printing paper.

The IS manager is given a printout of the results that list every operation and cost, including such items as cost per million instructions per second, cost per unit stored and cost per line printed.

Compass presents the overall results in what it calls a Compass diagram, which is understandable by nontechnical manag-

ers. Besides measuring IS performance in absolute terms, the company compares client performance to peer companies in Compass' data base of 150 international firms. The data base includes clients from Scandinavia, the U.K., West Germany and now the U.S.

One of Compass' primary competitors as it enters the U.S. market is Real Decisions Corp. (RDC), a Darien, Conn.-based comparative metrics provider that has been in business since the 1970s.

RDC's service, called Decision Support Center (DSC), is based on an array of pricing algorithms and on-site benchmarks that compare a client's service and cost levels with those of 120 other multi-industry clients. In an RDC evaluation, a company is ranked within its industry and within

the total data base and given an overall performance number on the Normalized Weighted index.

Fees for both Compass and RDC evaluations range from \$20,000 to \$150,000, depending on the size and complexity of the client's data center. The average cost is about \$45,000 to \$50,000, Compass creator Blitz said.

Some users have found the cost of a metrics evaluation well worth the investment. A large U.S. consumer products company saw a 40% reduction in data center costs in the two years after it hired both Compass and RDC to do comparative metrics in 1988.

The IS department used the metrics evaluations to revamp its data center, a move that has saved the company millions

of dollars, according to the firm's IS manager, who requested anonymity.

Among the most significant changes was a reduction in IS staff from 130 in 1988 to 80 in 1989, as well as the addition of Amdahl Corp. mainframes to its IBM data center.

"These companies were a great service because they were able to do a thorough analysis of every detail of our data center," the manager said. "We discovered our data center wasn't running as well as it could, and we found out what we needed to do to make it more cost effective."

Len Bergstrom, an RDC executive vice-president, said that while many companies need to cut back on data center expenses, others need to do little more than fine-tune their operations.

Gerri Magers, chief deputy director of California's Health and Welfare Agency, had one such operation. She had RDC do a cost evaluation of the agency's data center last winter and found that the center, which provides data processing services to all departments within the agency, was ranked in the top 10% for cost-effectiveness against the entire data base and in the top 1% for similar-sized companies.

"We're a fee-for-service organization, so customers want to know we're cost conscious and they're getting a service at a reasonable cost," said Magers, who plans to have the data center reevaluated next year. "A customer will put greater stock in a study done by an outside source than in one that was done internally."

Magers said the greatest value of a benchmark service such as the one RDC provides is that it highlights areas that need improvement.

"When you're around something all the time, it's easy to unintentionally overlook the defects in your system," she said. "In our case, we discovered our rates for print services were too high — which we had no idea about — and we've since rectified the problem."

Compass and RDC stressed that companies are not identified when overall averages are computed. Those companies who are stellar performers can, and do, advertise this fact, but RDC and Compass are not authorized to do so.

Ron Brown, an independent telecommunications consultant in Melrose, Mass., said benchmarking data centers is becoming popular with companies that are looking at the IS organization in an effort to cut costs. He advised the use of benchmark evaluations for any company that is considering outsourcing.

"Benchmarking certainly doesn't eliminate the need for outsourcing, but it could erode a case for it," he said. "A benchmark is worth the investment because it provides important information, but it's only valuable if the company knows how to prudently interpret the results."

While benchmark consultants have traditionally targeted their sales pitches at IS managers, Bergstrom said they are now aiming at chief executive officers and other top corporate officers because the responses from those within the IS organization for cost assessment has been largely apathetic.

"Requesting a metrics benchmarker should ideally be done by the IS manager, but that's often not the case because IS commonly views it as a threat," said Keith Osman, vice-president of production and administration at Heller Financial. "If the CIO requests it, it's a proactive move. If the CEO or [chief financial officer] requests it, it's often a reactive move." □

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INTERNATIONAL NETWORKS

USER STRATEGIES, INTERNATIONAL SERVICES & REGULATION

Worth Noting

Fifty percent to 60% of all transpacific network traffic is either Group III or Group IV facsimile, according to Ken Zita, an independent consultant in New York.

World News

AT&T and Belgian carrier **Regie des Telegraphes et des Telephones (RTT)** last week announced plans to offer one-stop shopping, switched digital communications and international virtual net services between the U.S. and Belgium.

AT&T and the RTT plan to begin offering international switched 56K and 64K bit/sec services between the two countries in November, according to Susan Mirbach, president of **RTT-Belgian Telecom USA**, a subsidiary of RTT in Westport, Conn. In Belgium, users will be able to access this service via RTT's Integrated Services Digital Network offerings or through dedicated 2.048M bit/sec links to RTT points of presence (POP).

Access in the U.S. will be available via dedicated links to an AT&T POP or via local switched digital or ISDN services.

Users in Belgium will also be able to integrate Belgian sites into an AT&T-supplied Software-Defined Network by maintaining dedicated links to an RTT gateway switch, expected to be cut over in April 1991. In addition, AT&T and RTT agreed to act as a one-stop shop for users ordering private lines between the countries.

AT&T also announced plans to interconnect its global messaging network with the RTT public data network via an X.400 gateway.

These agreements follow similar announcements made earlier this year by RTT and MCI Communications Corp. to cooperate in the provision of international virtual networks and one-stop shopping. **□**

Australia's carriers at a glance

Carrier	Australian Telecommunications Corp.	OTC, Ltd.	Aussat Pty., Ltd.
Location	Melbourne	Sydney	Sydney
Year founded	1975	1946	1981
Services provided	Monopoly supplier of domestic terrestrial voice and data services	Monopoly provider of international services	Provider of satellite services in Australia and New Zealand
Revenue*	\$7.98 billion	\$1.52 billion	\$140 million
Earnings*	\$973 million	\$235 million	\$2.25 million
Number of employees	84,000	2,300	300

*Figures in Australian dollars

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: COMPANY REPORTS

Australian gov't approves plan to open telecom mart

Privatized Aussat will vie against Megacom duo.

By Barton Crockett
Senior Editor

CANBERRA, Australia — The ruling cabinet of Australia recently approved a plan to break up a state-run monopoly on telecommunications services by fostering network competition in the country.

Under the plan, which is expected to be formally adopted at a meeting of the ruling Labour party this week, Australia will merge Australian Telecommunications Corp., the government-owned domestic carrier, with OTC, Ltd., the government-owned international carrier.

These two carriers will form a new government-owned carrier currently nicknamed Megacom.

In addition, Aussat Pty., Ltd., the government-owned satellite service provider, will be sold to Australian and foreign investors and allowed to compete with Megacom in the provision of domestic and international services (see graphic).

According to Gregg Dunfield, a vice-president in OTC's White Plains, N.Y., office, the decision to restructure Australia's telecommunications industry was made because regulators believe competition will improve network service and lower prices.

"If you look around the developed world, [you see that] competition has existed in the U.S., the U.K., Japan, New Zealand, and it will shortly exist in Australia," Dunfield said. "The reason is that the regulators in each of these countries are convinced that competition provides more services at a better price to their constituents."

The restructuring is expected to be completed within a year and a half, he added.

Dunfield said that further mo-

tivation for the move could have been disappointment with the financial performance of Aussat, which operates three satellites to provide private network services to users in Australia and New Zealand.

Founded in 1981, Aussat began providing commercial services in 1986 and lost a total of about \$57.82 million (\$70 million, Australian) until turning its first profit, approximately \$1.85 million (\$2.25 million, Australian) on revenues of about \$115.64 million (\$140 million, Australian) in the fiscal year ended June 30, 1989, according to an Aussat spokesman.

Dunfield said government regulators may be looking to beef up Aussat's financial performance

It is not clear how large a stake in Aussat foreigners will be able to purchase, Dunfield said.

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by selling it to private industry and giving it permission to offer terrestrial and satellite-based switched services.

Some details still unclear

Dunfield cautioned that the details of the restructuring have not been finalized yet. For example, he said it is not clear how large a stake in Aussat foreigners will be able to purchase, although the majority stake in the company will likely be reserved for Australian investors.

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S. American carriers support digital links

Carriers add digital support to terrestrial net to enable users to install int'l digital satellite links.

By Barton Crockett
Senior Editor

Carriers in South America are taking steps to enable customers to improve communications to that continent by supporting international digital satellite services.

Users and vendors said South American carriers are only now installing digital earth stations and local loop facilities in major cities to support international digital circuits. Further, they said some carriers are now willing to give users regulatory permission to operate earth stations for private links to the U.S.

With Citicorp and Shearson Lehman Brothers, Inc. installing and operating some of the first digital private links to countries such as Chile and Brazil, observers predict other users will do the same, stimulating a large-scale migration from analog services to more reliable and cost-effective digital facilities.

"Once the first guy puts his toe in the water, the others will fol-

low suit," said Yousef Javadi, vice-president for sales and marketing at Overseas Telecommunications, Inc. (OTI), an international satellite service provider in Alexandria, Va.

New facilities

Users say that the digital links are springing up now because South American carriers are cutting over the facilities needed to support international digital circuits or giving users the necessary regulatory approvals.

Typically, these links are provided over satellites owned by the International Telecommunications Satellite Organization, a multinational satellite consortium based in London.

In most implementations, users will maintain dedicated terrestrial links to shared satellite earth stations operated by carriers in the U.S. The earth stations then bounce digital signals off INTELSAT satellites to shared earth stations owned and operated by

(continued on page 36)

New transponders to ease int'l satellite link shortage

By Maureen Molloy
Staff Writer

HONOLULU — Users in need of international satellite links can expect relief from the current capacity shortage when 24 transponders on two NASA satellites become available for commercial use early next year.

Columbia Communications Corp., an 8-year-old Honolulu-based developer and operator of satellite communications systems, three months ago won a bidding battle for control of the C-band transponders on two National Aeronautics and Space Administration tracking and data relay satellite systems (TDRSS).

The C-band transponders are separate from the satellite's Ku- and S-band transponders, which NASA uses for space shuttle operations and communications with scientific satellites.

Although Columbia does not anticipate leasing capacity directly to end users, making the transponders available to carriers should help ease the shortage of international satellite links and

translate into more end-user options.

"I think telecom carriers and video programmers will find the Columbia/TDRSS system attractive simply by virtue of the fact that it's available now," said Columbia Chief Executive Officer Clifford Laughton.

The two satellites — one in orbit over the Pacific and the other over the Atlantic — will provide links between North America, Europe and Northern Asia.

The Atlantic satellite will cover both Eastern and Western Europe and the eastern two-thirds of the U.S., while the second satellite will cover the northern Pacific Rim and the western third of the U.S. Both satellites have 12 36-MHz C-band transponders.

NASA originally awarded control of the C-band transponders to the International Telecommunications Satellite Organization for \$51 million, despite Columbia's higher bid of \$61 million, because NASA was not convinced Columbia could finance the project, according to

(continued on page 91)

S. American carriers support digital links

continued from page 35

South American carriers. Users in that continent can then access those earth stations, also via dedicated terrestrial lines.

Alternatively, some users are installing earth stations on their own premises to support the international satellite links.

Shearson goes digital

According to Achin Dasgupta, vice-president for international telecommunications at Shearson Lehman, the investment firm installed the world's first international digital private line link to South America when it cut over a 64K bit/sec link from New York to Santiago, Chile,

earlier this year.

This link consists of two compressed voice channels operating at 15K bit/sec. The rest of the capacity supports the communications of vital trading data between Shearson Lehman's Santiago office and its corporate headquarters in New York. Shearson shares the line with its parent company American Express Co.

Dasgupta said that one of the voice channels is used by Shearson Lehman and the other by American Express. He said the investment firm has used the link to replace an old analog circuit, which transmitted trading data between Santiago and New York at 75 baud.

According to Dasgupta, brokers in Chile use the link to route buy and sell orders to New York on behalf of their customers.

Confirmations of the trades are routed back over the international link to the Santiago office and then relayed to customers in the country.

Previously, Dasgupta said brokers and their customers had to wait until the evening or the next day to get confirmation that trades had actually been executed. This was because the 75 baud link was so slow that confirmations had to be queued up until the flow of buy and sell orders stopped at the end of the day.

Dasgupta noted that confirmations can now be routed back to Santiago instantly, which has improved Shearson Lehman's customer service in Chile. He said Shearson Lehman spends about the same amount of money for its half of the digital link as it did for the dedicated analog line.

This means the firm is actually saving money since international dial-up expenditures have been reduced by routing voice traffic over the digital link.

Other links slated

Citicorp recently installed an international satellite-based circuit running at 64K bit/sec between a Pompano Beach, Fla., data center and company offices in Santiago, according to Miguel Verdaguer, assistant vice-president for telecommunications at the bank holding company.

Verdaguer said that other links running at 128K bit/sec are slated to be installed between the Pompano Beach data center and Buenos Aires, Argentina, and San Paulo, Brazil, in about two months.

OTI's Javadi said that a digital link between Citicorp's Pompano Beach data center and company offices in Colombia is expected to be cut over during the first quarter of 1991. OTI will supply the inter-

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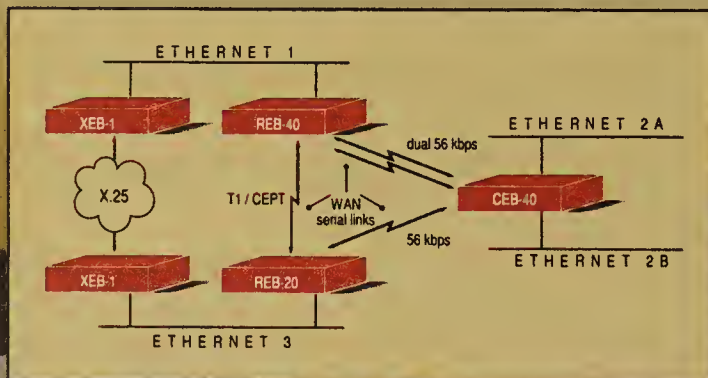


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See The FAXNET Form on Page 62

Some users are installing earth stations on their own premises to support the international satellite links.

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national satellite services to Citicorp via an OTI earth station at Citicorp's premises in Pompano Beach that will bounce signals off INTELSAT satellites to local earth stations. Javadi said some of these earth stations, such as the one in Brazil, will be owned and operated by Citicorp, while others will be carrier-owned. Javadi added that Citicorp will be one of the first companies ever to run digital satellite links to Argentina, Brazil, Chile and Colombia.

Verdaguer said that the new digital satellite links will enable Citicorp to vastly improve communications to South America for about the same cost as analog lines. He predicted that other U.S. firms will follow Citicorp's lead and install digital satellite links to South America. □

Australia approves plan to open mart

continued from page 35

Dunfield said it is likely the government will support a privatization plan for Aussat similar to that used in the privatization of Telecom Corp. of New Zealand, Ltd. In that plan, Ameritech and Bell Atlantic Corp. were permitted to acquire 90% of the carrier, under the condition that they reduce their ownership to 49.9% over three years.

Dunfield said Aussat will be given equal access to Megacom facilities at the same cost that the new Megacom carrier will pay. He predicted that Aussat will focus on providing long-distance services, relying on local loop facilities from Megacom to access customers.

Currently, OTC is the only Australian carrier authorized to provide services over International Telecommunications Satellite Organization satellites and international undersea cables running into Australia. Dunfield said that the Australian government will either order OTC to make these facilities available at cost to Aussat or give control of these facilities to a neutral third party. □

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First Look

Software mixes document management, imaging

Network Management, Inc. (NMI) recently introduced software that merges the capabilities of the company's document management system and an electronic imaging system.

Unveiled at the recent NetWorld '90 conference in Dallas, **EnFold** combines the capabilities of NMI's LANfolio document management software and its Imagery product, which is a local-area network-based imaging system consisting of both hardware and software.

EnFold runs on popular LAN operating systems including Banyan Systems, Inc. VINES and Novell, Inc. NetWare.

The basic function of the document management component, which is based on an SQL data base, is to simplify the organization and storage of electronic files on a LAN. Imagery performs document scanning, optical disk storage, retrieval and high-resolution display of documents.

With the EnFold product, users have a single integrated system that enables them, for example, to view an SQL directory of files and then display one or more of those files using the imaging component.

The document management software costs \$2,995 for a LAN server license and \$150 per client workstation. The imaging components, including an Intel Corp. 80386-based personal computer, scanner, high-resolution monitor and network interface card, cost roughly \$30,000.

Users can also purchase software to install only on their personal computers at a cost of \$450.

Network Management, Inc., 11242 Waples Mill Road, Fairfax, Va. 22030; (703) 359-9400.

ISA-based LAN server supports up to five 80286s

Integrated Workstations, Inc. recently introduced **MultiServer**, a network server that uses an Industry Standard Architecture bus to interconnect five processors in a single server.

(continued on page 38)

Gateway lets NetWare 386, TCP/IP LANs swap data

Eliminates need to load software on each node.

By Tom Smith
New Products Editor

DALLAS — Racial InterLan recently announced a gateway that enables Novell, Inc. NetWare 386 users to exchange data with local-area networks supporting the Transmission Control Protocol/Internet Protocol.

The product will enable users to implement a single gateway capable of handling data conversions between NetWare Integrated Packet Exchange (IPX) protocols and TCP/IP at less cost than packages that force users to install IPX and TCP/IP protocols on individual workstations to handle the conversions.

TCP Server for NetWare, introduced at the recent NetWorld '90 show in Dallas, is a single program running on a gateway personal computer that establishes TCP/IP sessions with multiple NetWare servers and clients.

Until now, vendors including Racial InterLan have offered NetWare-to-TCP/IP connectivity that typically involved running both Novell's IPX and the TCP/IP

protocol stacks on individual client workstations, according to Robert Nerz, software product line director at Racial InterLan.

If 200 users on a LAN required access to TCP/IP networks, for instance, users would have to install 200 copies of the software, which increases expense and maintenance, Nerz explained. In addition, TCP/IP usage is less frequent than NetWare usage so users should not be required to install software to support TCP/IP connections on every LAN node.

TCP Server for NetWare consists of software running on a nondedicated OS/2-based personal computer. Interfaces within the OS/2 personal computer provide the physical interface between NetWare clients and servers and the TCP/IP LAN.

The new gateway supports both DOS and OS/2 clients, and has been optimized for use with NetWare 386. It builds on the capabilities offered with the company's TCP Gateway, a NetWare-to-TCP/IP gateway that worked (continued on page 38)

Network Systems router connects two FDDI LANs

MINNEAPOLIS — Network Systems Corp. recently unveiled a new router that links separate FDDI nets supporting multiple transport protocols.

The company's new FE649 router will enable users to isolate a small number of nodes that generate excessive traffic so they do not rob available bandwidth from other network nodes.

In addition, the router can assist users in connecting nodes on different Fiber Distributed Data Interface rings.

The FE649 router links two FDDI dual counterrotating rings supporting the Internet Protocol, the Digital Data Communications Protocol in Digital Equipment Corp.'s DECnet Phase IV software and Network Systems' proprietary transport protocol.

The router comprises two internal FDDI interfaces — one for each ring connection — as well as a router card that supports the three protocols.

The FE649 is based on Network Systems' Data Exchange (DX), which links hosts to a variety of local-area networks and transmission lines, including Ethernet, FDDI, T-1 and T-3.

When configured to link a host to an FDDI LAN, the DX previously only supported a single FDDI interface and was not used to link two FDDI LANs. The DX also supported the same router card used in the FE649, but that router was used to link hosts, not LANs.

Packet filtering

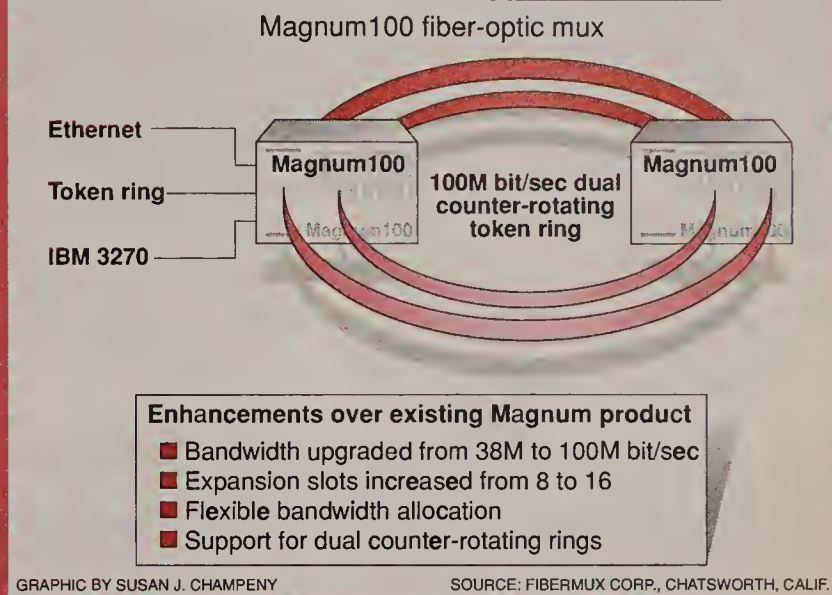
A firmware-based feature of the router interface, known as the Packet Control Facility, performs packet filtering so that individual workstations may be granted or denied access to other workstations. Data flow can also be restricted based on protocols.

The FE649 offers Simple Network Management Protocol (SNMP) management functions through an existing SNMP agent running on both the FDDI interfaces and the router. Those SNMP agents communicate with SNMP host software running on a Sun Microsystems, Inc. workstation.

The FE649 is available now at a price of \$54,000, which includes all hardware components.

Network Systems is located at 7600 Boone Ave. N., Minneapolis, Minn. 55428; (612) 424-4888. □

Fibermux's alternative to FDDI



Mux supports 100M dual fiber-optic rings

Fibermux positions new Magnum100 multiplexer as alternative to implementing 100M FDDI LANs.

By Tom Smith
New Products Editor

CHATSWORTH, Calif. — Fibermux Corp. last week introduced a version of its fiber-optic multiplexer that supports 100M bit/sec bandwidth and a maximum of 16 data interfaces.

The Magnum100 more than doubles the bandwidth of its Magnum predecessor, which only supported 38M bit/sec of bandwidth. The Magnum100, while not supporting the Fiber Distributed Data Interface standard for local-area networks, uses time-division multiplexing to divide available bandwidth between 16 data interfaces.

The product will typically be used to link users on different floors of a building, according to John Reidy, market segment manager at Fibermux. Because Magnum100 supports a wider variety of traffic types than FDDI, it is an attractive alternative to the 100M bit/sec LAN standard, Reidy said.

The Magnum100 gives users an alternative to implementing FDDI LANs that typically function as a backbone for token-ring and Ethernet LAN traffic. In addition to LAN traffic, the Magnum100 supports IBM 3270 and other types of data by dedicating time slots within the 100M bit/sec bandwidth to those types of traffic.

Unlike FDDI, Fibermux's time-division multiplexing technique does not packetize data so it does not generate transmission overhead that can occur with FDDI, Reidy explained.

In addition, because Magnum100 does not use a token-passing scheme, users do not

have to wait for a token before transmitting data. This lack of delay makes Magnum100 attractive for time-sensitive communications, Reidy said.

Magnum100 uses the same data interfaces as its predecessor, which was introduced in 1987, but the older Magnum had only eight expansion slots, compared with the Magnum100's 16.

Magnum100 has also been enhanced with a new CPU board that can support 100M bit/sec of bandwidth. That board, known as a Control Logic Module, can determine the transmission bandwidth required by each local interface and allocate the necessary amount to that interface.

The product will typically be used to link users on different floors of a building.

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The older Magnum product, by contrast, allots an equal 4.7M bit/sec portion of its total bandwidth to each interface, regardless of the amount required. For low-speed terminal traffic, then, bandwidth could be wasted, while data passed over from a 16M bit/sec token ring would be buffered and, consequently, delayed.

Another enhancement with the Control Logic Module is the ability to support a dual-counter-rotating ring similar to that used (continued on page 38)

Gateway lets 386, LANs swap data

continued from page 37

only with NetWare 286 and could support DOS computers exclusively.

A single copy of the gateway software can support multiple NetWare file servers and 60 simultaneous Telnet virtual terminal sessions.

The Racal InterLan Ethernet interface board, the NP600/XL, has TCP/IP drivers and provides the physical connection to the TCP/IP LAN. The gateway software, which works on an Intel Corp. 80386-based personal computer running OS/2, performs protocol conversion between NetWare's IPX and TCP/IP. TCP Server for NetWare can support NetWare LANs that

use Ethernet, token ring and Arcnet access methods.

The gateway supports bidirectional communications so that a TCP/IP host, for example, can transfer files to a NetWare LAN, while a NetWare client can request data from a TCP/IP host.

In addition to Telnet, the gateway supports all major TCP/IP protocols, including File Transfer Protocol and Simple Mail Transfer Protocol for messaging.

TCP Server for NetWare, including Ethernet interface and software, is expected to be available in 30 days at a cost of \$5,995.

Racal InterLan can be reached by writing to 155 Swanson Road, Boxborough, Mass. 01719, or by calling (508) 263-9929. ☐

Mux supports 100M dual fiber-optic rings

continued from page 37

in FDDI nets. This ensures that failure in one ring will allow traffic to continue unabated after being switched over to the other ring. The older Magnum supported only a single ring.

The new unit can support a maximum of eight Ethernets, four 16M bit/sec token rings or 512 IBM 3270 terminals. The 512 terminals would be supported by 16 32-port RS-232 interfaces.

Because the new Control Logic Module has the same physical connection to a fiber-optic cable used in FDDI nets, users that want a migration path to FDDI can install FDDI cabling with the Magnum100

and later exchange that for FDDI gear from Fibermux or other vendors.

The Magnum100 supports a maximum fiber run of 50 kilometers, or 31 miles, between the two multiplexers.

Users can manage the Magnum100 at the physical layer using Fibermux's LightWatch Network Management Software, which runs on a DOS-based personal computer attached to the unit via an RS-232 port. This setup allows users to view alarms and perform loop-back tests, for example. As an alternative, users can install on that same personal computer an optional software component that allows the personal computer to communicate with IBM's NetView through a NetView/PC interface.

Pricing for the Magnum100 with Control Logic Module starts at \$4,850. Data interfaces, which are priced separately, range from \$695 to \$1,995. Current Magnum users can upgrade but only by keeping their existing data interfaces and installing them in the new Magnum100 unit.

The product is available now.

Fibermux can be reached by writing to 9310 Topanga Canyon Blvd., Chatsworth, Calif. 91311, or by calling (818) 709-6000. ☐

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First Look

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Introduced at the recent Network World '90 show in Dallas, the MultiServer uses a proprietary backplane that supports as many as five Team/286 server segments in a single chassis, all of which are connected via an AT-compatible bus. Each Team/286 segment is an 80286-based networked computer on a card that supports from 512K to 16M bytes of main memory.

Integrated Workstations began shipping MultiServer this month. Prices start at \$1,195 for a 14-slot, five-processor system that includes a power supply and high-capacity cooling fans.

Integrated Workstations, Inc., 1648 Mabury Road, San Jose, Calif. 95133; (800) 832-6526. ☐

Northern Telecom unveils software to monitor LANs over WANs

Northern Telecom, Inc. recently introduced **DPN Lanscope**, software that lets network administrators remotely manage local-area networks over wide-area networks that are based on DPN-100 packet switches.

DPN Lanscope is software that resides on devices in the LAN, as well as on a Sun Microsystems, Inc. workstation running DPN Advisor, Northern Telecom's network management software for monitoring and controlling DPN-100 packet switches.

DPN Lanscope provides fault and performance monitoring, resource management, software distribution and usage tracking for geographically dispersed LANs. Network configuration, status, alarms and performance information are presented to a centralized LAN administrator through a graphics-based user interface.

DPN Lanscope, developed by Connect Software, Inc. in conjunction with Northern Telecom, was introduced and demonstrated at NetWorld '90 in Dallas.

It is expected to be available next May for \$700.

Northern Telecom, Inc., Nashville, Tenn. 37228; (615) 297-0636. ☐



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Offer expires October 9, 1990. Installation needed by December 10, 1990.

*Discounts on average as compared to AT&T basic interstate service for a typical business call. Actual savings may vary according to calling patterns and usage. Access charges not included.

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OPINIONS

MANAGEMENT ISSUES

BY ELLEN GOODMAN

The cordless tie that binds people to their work

I am standing in the lobby of a large office building when the man beside me starts talking into his briefcase. The fellow looks "buttoned up" and rational so I assume if he is hearing voices, they are real ones. There is a phone in his briefcase.

I am sitting at a red light in traffic when the car beside me starts ringing. The driver picks up the receiver and begins a now common routine. She steers her car with one hand and her business with the other.

I am somewhere over Connecticut on a one-hour shuttle from Boston to New York when my companion sticks his credit card into the chair in front of us and calls his office to find out if there are any messages. At 22,000 feet, he leaves a phone

message in Boston about where to forward his phone messages in New York.

Today, there are people within reach of a phone almost every moment of their lives.

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Once upon a time, a sitcom hero named Maxwell Smart used to talk into his shoe and we laughed. But somewhere along the line, the high-tech gadgetry of the spy films got transformed into the tools of everyday trade.

Today, there are people within reach of a phone every moment of their lives except

takeoff, landing and a long tunnel ride. The "work world" is now an interlocking network of communications and messages, a proliferation of phones, a great babbling overkill of push-button technology.

We live from call waiting to call forwarding, from answering machines to voice mail. We are surrounded by cellular phones and portable phones. We even have a little pocket phone to form a "personal communications network."

In theory, this population explosion of phones and their "fax-similes" has sprung into being to offer mobility and freedom from the office. Indeed, people who take phones to the gym, the restaurant, even the bathroom, swear by the freedom they gain with this telephone tether.

But watching my colleagues-on-call, I have become convinced that this network is a tie that binds more and more people to work.

The executives who go to the beach with a towel and a telephone aren't liberated from the office; they are only on work release. The cellular commuters haven't changed the work environment; they have turned every environment into work space. The new touchable class reminds me of parolees let out of jail after being collared by a tracking device.

I admit to being somewhat "phonephobic." One of the great pleasures of life is being out of touch. If I were to devise a home voice mail, it would say: Touch 1 if this is a life-threatening emergency. Touch 2 if you are a family member with a flat tire on a dark corner. Touch 3 if you are a junk phone call and would like to be immolated.

But even by normal standards, we've gone too far. In the work world, we are increasingly seduced by the notion of how efficient it is to be in constant contact with one another. The phone, in all its forms, has become a kind of endless meeting that entices us to spend more time communicating than producing. And the operative phrase is "more time."

The Bureau of Labor says that Americans are working longer hours than we used to. Twenty million or so have bumped the

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Goodman is a syndicated columnist for The Boston Globe. Reprinted with permission. (c) 1990, The Boston Globe Newspaper Co./Washington Post Writers Group.

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EDITORIAL

E-mail messages should be kept private

Should messages carried over a corporate electronic mail system be considered private?

That's the issue in a multi-million-dollar class-action lawsuit filed against a California-based company, which, according to the plaintiffs, routinely reviewed thousands of employee E-mail messages. The suit, filed by former employees, charges the company with invasion of privacy.

Whatever the merits of that particular case, we stand on the side of messaging privacy.

With certain exceptions, internal electronic messaging systems should be private — that is, the messages carried over them should be read only by the sending and receiving parties.

That's a statement many of our readers will probably take issue with, but we believe that failing to ensure privacy limits the value of networking.

Open networking involves more than simply providing for

physical connectivity between devices. The real value of open networking is that it enables employees at all levels to communicate frankly and share information easily. Open networking helps firms break down organizational barriers, strengthen relationships and foster the free exchange of opinions and ideas.

That type of communication builds teamwork, improves productivity and helps a company compete more effectively.

Failing to ensure the privacy of messages can have a chilling effect on the free exchange of information. It can also seriously damage trust in upper management and, what's worse, undermine open networking efforts.

Some say that companies have every right to monitor messages carried over corporate computer systems.

But that approach could be dangerous if extended to other areas. For example, could companies eavesdrop on telephone

conversations made from work? Should they be able to read private mail delivered to the workplace? What about placing listening devices in offices?

Certainly, for companies whose work is highly classified, this issue takes on a different perspective. But for most companies, ensuring privacy of messages seems to be the most appropriate approach.

At the very least, a company must make its messaging policy abundantly clear to all system users. If messages are fair game for other readers, the end users need to know.

We'd like to know what you think about this issue and what steps your company has taken to address concerns about messaging privacy.

You can drop us a line at the address above or leave a message on our Bulletin Board System (BBS). Instructions for using the BBS are in the Table of Contents on page 2. □

OPINIONS

NETWORK INVESTMENTS

BY MARVIN CHARTOFF

Cost-justification can be a tricky proposition

Persuading upper management to invest in additional or upgraded network resources has always been a difficult assignment. To gain approval for strategic network investments, network managers must present a case based on business impacts such as increased competitiveness and improved quality, as well as traditional cost savings.

According to the basic tenets of economics, the amount of labor and capital used is the determining factor in an enterprise's production output. However, this simple model must be updated to reflect the fact that information is another raw material.

Used effectively within an enterprise, information could have a significant impact on business profits and growth. Therefore, one would think network managers could justify investment in network resources relatively easily. In reality, it is a very difficult job. One of the basic problems is how to quantify the "return" on a network investment.

Cost savings trends

Network operations is typically both the beginning and end point for a network manager attempting to justify additional network expenditures. The current proliferation of T-1 backbone networks is the result of cost savings opportunities through shared network bandwidth between voice and data networks or multiple data nets.

Another trend ignited by cost control of network operations is the hot topic of outsourcing, which reduces personnel costs through the use of third-party resources. Even investment in local-area networks usually starts at the departmental level, where the sharing of printers and storage space can justify the

Chartoff is a senior manager at Ernst & Young's Network Strategies consulting practice. Ernst & Young is a Fairfax, Va.-based provider of telecommunications consulting.

installation.

All of these examples show how net managers can use cost savings or cost avoidance to recover the initial investment.

However, the improvement to network operations does not fundamentally affect the strategic capabilities of the business.

An investment in network resources that will make an enterprise more competitive and offer better service to its customers would seem to promise greater strategic returns. However, the returns are difficult to measure.

Giving sales representatives

Another trend ignited by cost control of net operations is the hot topic of outsourcing.

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the ability to enter orders or receive up-to-the-minute status on them by using dial-up laptop computers provides a significant competitive advantage. The return on the investment in laptops, modems and long-distance services can be measured in increased revenue per sales representative and shorter sales cycles.

The movement toward computer-integrated manufacturing, heavily dependent on network resources, typically justifies expenditures based on achieving the goals of improved product quality, minimized inventory levels and reduced product lead time.

Disaster recovery investments are an insurance policy that can guard against lost orders and degradation of product and service quality.

Quantifying investments

Quantifying the business impact of network investments requires the network manager to

work closely with the functional business areas. Existing and planned network applications should be documented and analyzed to demonstrate the critical nature of the network to business continuity. Network applications should be examined for circumstances where timing and availability of information are critical to market success.

In addition to improving an enterprise's ability to compete, network investments can also increase employee productivity. Electronic mail and voice mail have their critics, but if used properly, these two network-based services can make a company's internal communications more efficient.

Similarly, videoconferencing is a network technology that organizations typically try to cost-justify on the basis of savings on travel. However, the real benefit of videoconferencing results from the ability to quickly pull together key decision makers and react to market events. Important executives can significantly increase their productivity because they don't have to waste an entire day on a single one-hour meeting.

Coordinating geographically dispersed work groups can be enhanced through the electronic exchange of project files such as spreadsheets or reports, thereby saving time and effort.

Productivity investment justifications typically revolve around the increased output per employee or the reduced number of staff required to achieve the same output. In either case, the network manager must understand the operations of the business entities that will use the new net resources and how the network impacts productivity.

Investment in network resources can have a significant impact on the success of an enterprise. Network managers must understand the strategic benefits of networks and information access, and justify network investments that could move or keep their companies ahead of the competition. **Z**

TELETOONS

BY FRANK AND TROISE

Yet another great feature...in six months this little red flag will pop up to remind you that the entire system has become obsolete..



LETTERS

Facing the global reality

I'm writing in response to the editorial "RBHCs' double standard raises user hackles" (NW, July 2).

Your position seems to create its own double standard. Millions of us sit here daily and lament the influx of foreign investment in Rockefeller Center and other "bastions of America." These "nasty" investors do exactly what the regional Bell holding companies are trying to do for the U.S. Imagine your response if France Telecom purchased US West, Inc.

By your logic, we should not compete on a global basis but build networks only at home. Let's recognize the global reality and stop fighting it. Strategic advantages can be gleaned from having a strong U.S. company firmly placed in overseas telecommunications markets.

The RBHCs and others must be permitted, and even encouraged, to invest overseas. We stand a much better chance of successfully competing and exporting our technology if we have some control over the foreign purchase.

With our balance of payments heading beyond comprehensible amounts, such actions must receive national support.

Remember, the profits return to the U.S., where our regulators can regain some control. I would rather see the profits from overseas ventures build our networks than have that burden placed on the rate-payers.

Dick Boley
International manager
Westinghouse
Communications Systems
Pittsburgh

Whose double standard?

This is in response to your editorial titled "RBHCs' double standard raises user hackles" (NW, July 2).

It is not the regional Bell
(continued on page 90)

Network World welcomes letters from its readers.

Letters should be typed, double-spaced and sent to Editor, Network World, 161 Worcester Road, Box 9172, Framingham, Mass. 01701.

Letters may be edited for space and clarity.

NOTHING IN LIFE IS SO EXHILARATING as to be shot at without result, according to Winston Churchill. Who's taking shots at you and missing? Let us know in an opinion column.

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If you'd like to write a column, call Alison Conliffe, assistant features editor, at (508) 820-7416 or fax your idea to us at (508) 820-3467.

A larger frame of reference

By MARK LANGNER

The extended superframe format (ESF) is the technical exemplification of the adage, "An ounce of prevention is worth a pound of cure."

By checking ESF signals as they pass through the network, carriers can unobtrusively monitor circuit performance indicators in real time — often detecting problems before total circuit failure occurs.

Due to its enhanced monitoring capabilities, ESF is replacing the older superframe D4 framing format for tracking private-line performance. Yet despite the obvious advantages of ESF for private-line users, the major carriers' level of ESF support still varies substantially, a full four years after AT&T first announced support of ESF for its Accunet private-line services.

ESF's functions

Each T-1 frame consists of 24 8-bit channels, plus one frame bit, for a total of 193 bits per T-1 frame. Frames are transmitted 8,000 times per second. Therefore, since the frame bit is repeated 8,000 times per second, it constitutes an imbedded 8K bit/sec data channel within the overhead of the DS1 signal.

The older D4 superframe technology

Langner is an associate with TeleChoice, Inc., a Manchester, Conn., telecommunications consultancy specializing in long-distance service competitive analysis and network design.

used all of the 8K bit/sec overhead for frame synchronization and signaling. ESF uses the overhead more efficiently, allocating only 2K bit/sec for this same frame synchronization and signaling, leaving 2K bit/sec for error detection using Cyclic Redundancy Check-6 (CRC-6) and 4K bit/sec for an open control channel called the Facility Data Link (FDL), which actually carries the ESF performance and alarm information through the T-1 circuit.

CRC-6 is a mathematical algorithm that allows for the detection of both logic and format errors. Thus, a higher percentage of circuit errors can be detected with ESF than with superframe, which detects format errors only.

Often, the errors that ESF detects are caused by problems with the user's network setup rather than with the carrier's network. For instance, if a user's network equipment is not synchronized properly, this problem would show up in the ESF registers.

ESF enables the carrier to monitor the DS1 facility throughout the private-line network. Before ESF monitoring, technicians had to shut down a circuit in order to test it. With ESF, the technician can remotely interrogate the ESF registers on a circuit to isolate the problem.

Line interface units monitor the DS1 signal for various error conditions. For example, errored seconds, severely errored

(continued on page 44)

A masterpiece of preventive line maintenance, the extended superframe format allows users to monitor their networks more effectively.

ILLUSTRATION ©1990 CAROL O'MALIA





(continued from page 42)

seconds and failed seconds are measured and stored in registers along the circuit's path. These different conditions enable the carrier to determine when the circuit quality begins to deteriorate.

Advanced carrier networks allow for sectionalized ESF monitoring and testing — that is, examining ESF information on portions of a circuit to isolate the problems. Pinpointing problems by sectionalizing provides a time-

trend analysis and data tracking to determine why a circuit is performing the way it is.

The carrier might respond by reengineering the circuit or adjusting the network. Rarely, however, will a carrier do more than merely maintain the network; the emphasis is on gathering information for the user.

A higher level of proactive support involves contacting users directly, before problems affect their network operations. Then

monitoring system. AT&T T-1 circuits that are part of a T-3 circuit are monitored individually.

Through ESF, AT&T can perform testing on any intercity circuit. Users can also send their own ESF testing signals from an ESF CSU over an AT&T circuit. However, a user must have appropriate equipment to accept and understand AT&T ESF information.

Users may access CSU register data with an ESF CSU management system.

AT&T's network can also "sectionalize" its own ESF testing, which means that AT&T can access ESF information stored in registers on a circuit-leg basis to pinpoint performance characteristics for specific portions of an overall circuit.

AT&T engineers routinely monitor ESF signals on users' circuits and determine at which point a performance problem is serious enough to warrant notification of a user. AT&T has published its standard levels of performance in *Technical Reference 62411*.

When ESF monitoring detects a signal beyond one of the published thresholds, graphical and audible alarms are triggered in AT&T's Atlanta and Walnut Creek, Calif., work centers.

Starting this fall, AT&T will move to the next level of ESF support, which involves more interaction with users. For problems that exceed the published threshold levels, AT&T will ask the user to release that circuit for maintenance instead of waiting for a user request.

When a user circuit is taken down for repair, AT&T will attempt to reroute that circuit if alternate routes are available. Users that want assured alternate routing must sign up with AT&T for direct customer control options such as CCR-Digital Access and Cross-Connect System

porting and alarm information, both on-line and in reports, from the AIM terminal. AT&T does not charge a customer for sending ESF information to a customer site. That is provided as part of the circuit.

The AIM system consists of a personal computer with graphics capability, a 9.6K bit/sec tie line connection to an AT&T center, software to manipulate the data and a modem for analog lines. The personal computer and modem are customer-provided; AT&T's AIM software costs approximately \$3,000; and the cost of the 9.6K bit/sec transmission line varies with distance.

Users may choose to have additional network management services performed at their location or at an AT&T site by dedicated personnel through the Accu-master Services program. Users can contract with AT&T for services five or seven days a week and up to 24 hours a day. Although prices for the service are proprietary, AT&T said they vary greatly.

In the near future, AT&T will

alized testing. This system allows WilTel to take action quickly in response to changes in circuit performance and to correct problems sooner through sectionalization capabilities.

DTMS allows WilTel to provide proactive maintenance service on both individual DS1 circuits and on DS1 circuits that are part of a fractional T-3 service. To date, WilTel is the only carrier with a formal fractional T-3 offering.

The DTMS architecture uses a remote monitoring unit (RMU) placed at each end of a DS1 circuit — between the interexchange carrier and local access facility — to monitor the superframe and ESF performance data in their registers. These registers are uploaded to a central processor on an hourly basis for historical trend analysis and storage. In the event of a problem, the RMUs automatically report the problems via alarms to the technicians in the WilTel NMC.

Acting on the DTMS alarms, WilTel technicians can determine the severity of a problem. The lo-

Pinpointing problems by sectionalizing provides a timely method of trouble isolation.



ly method of trouble isolation, allowing for faster, more definitive repair.

A big advantage of ESF is that it enables the user to make decisions on the level and extent of problems. For example, if ESF notes a "dribbling" or intermittent error — a minor problem sporadically affecting the line — the user can wait until off-peak periods to turn off the circuit for corrective action.

However, if ESF reports a major error, then the user might want to react faster, perhaps rerouting the circuit through customer-controlled reconfiguration (CCR) facilities or implementing disaster recovery plans.

Another advantage of ESF is that it provides historical information that allows a user to track any performance anomaly, such as burstiness, which could indicate a future circuit failure.

ESF currently has two main sets of standards: AT&T Technical Reference 54016 and ANSI T1.403. To date, the former has been the de facto standard, but the industry is gravitating toward ANSI T1.403 because of its superior architectural structure. Even AT&T now intends to upgrade to the ANSI standard.

Defining proactive ESF

Carriers differ in the degree to which they use ESF information in their network. A new buzzword in the industry is "proactive ESF monitoring" — using ESF information to prevent problems before they cause major outages.

At the base level, proactive maintenance involves monitoring the ESF signals for circuit problems.

Information is distributed to users via reporting or on-line services. Users are then responsible for requesting action on the problem circuit. Today, most carriers meet this minimal ESF support criterion.

More involved carriers incorporate ESF data into their day-to-day maintenance and operation activities. This includes doing

carrier technicians might implement customer-ordered rerouting or other maintenance activities.

It is important to note that while some carriers may claim to offer this higher level of proactive ESF maintenance, they may not have the lower level capability to implement corrective action properly. It does a user little good to know a problem exists if the carrier cannot implement a solution in a quick, organized fashion.

To date, only one carrier — Williams Telecommunications Group, Inc. (WilTel) — has officially launched an enhanced proactive ESF maintenance program for private-line customers. Other carriers are in different stages of implementing full ESF monitoring.

Carrier ESF support

Virtually all of AT&T's network is ESF-equipped. Most of AT&T's Accunet T1.5 private-line users are using ESF DS1s today.

AIM users can receive ESF reporting and alarm information from the AIM terminal.



However, many users have not purchased ESF-compatible channel service units (CSU) to extend the monitoring capabilities to the customer premises.

Converting Accunet T1.5 private-line users to ESF is done by installing ESF monitoring equipment at one or more points on the circuit.

With the full deployment of ESF in the network, upgrading users from D4 to ESF is accomplished by electronically changing the setting in the ESF monitoring equipment. New T-1s installed by AT&T are automatically hooked to the carrier's ESF

(DACS) or some other disaster recovery arrangement.

AT&T users can take further advantage of the ESF reporting capabilities by using a monitoring system called Accunet Information Manager (AIM). AIM works as both a stand-alone management system and an element management system defined by AT&T's Unified Network Management Architecture. AIM ties into AT&T's alarm, network configuration and circuit performance systems. Currently in controlled introduction, AIM is offered on contract with AT&T.

AIM users can receive ESF re-

incorporate ESF reporting capabilities in its Accunet Spectrum of Digital Services (ASDS). AT&T will monitor the DS1 systems that carry ASDS circuits using ESF; however, AT&T cannot monitor a DS0 or any of the intermediate bit rates.

WilTel's proactive services

WilTel announced the industry's first proactive maintenance service at the International Communications Association (ICA) conference in May. WilTel's DS1 Test and Management System (DTMS) marks the first venture by a carrier into the highest level of proactive DS1 level maintenance.

WilTel has supported the use of ESF on DS1s on its digital network since 1985. Additionally, WilTel provides its ESF DS1 users with centralized end-to-end testing from its National Maintenance Center (NMC) in St. Louis. Until this announcement, however, WilTel users had to provide their own CSU-based ESF monitoring systems to obtain full end-to-end ESF performance monitoring.

DTMS represents the first phase of WilTel's plan to provide proactive maintenance services to its private-line customers. The DTMS system allows WilTel to monitor both superframe and ESF DS1 circuits on a full-time nonintrusive basis from its NMC and to provide two-point section-

cation of the RMUs at each end of the circuit allows WilTel to isolate problems quickly.

If appropriate, the technicians then contact the user organization by telephone to advise it of the problem and schedule maintenance. This proactive approach means that a trouble ticket can be opened and the resolution process can begin without having to wait for the user to notice the problem and report it to WilTel.

The DTMS system was designed to support all types of DS1 formatting, including superframe and both the AT&T 54016 ESF and the ANSI T1.403 ESF. WilTel customers obtain the maximum benefit from the use of ANSI T1.403 ESF CSUs, which allow the DTMS to directly monitor all segments of the DS1 circuit, including the out-drop portion of the local access facility, instead of requiring the isolation of the out-drop portion.

Another unique characteristic of the ANSI approach is that the monitoring device does not become an additional point of failure on the circuit. With the AT&T 54016 alternative, the circuit is wired through one or more line interface units, which can add multiple points of electronic failure.

To focus attention on the proactive service aspect, WilTel has chosen not to provide written or electronic access to the performance data in conjunction with

the initial implementation of its proactive service plan. WilTel is in the process of identifying which information will be useful to users and the most effective way to share it with them.

The carrier is likely to provide access to the information via its recently announced On-Line Information Service, an ancillary service designed for on-line access to its order tracking and trouble management systems.

The initial phase of WilTel's proactive service plan is nearing completion, with the final installations of DTMS DS1 performance monitoring scheduled for October. WilTel has recently added DS3-level circuits to its proactive service through a separate DS3-level performance monitoring system.

In the near term, the carrier will concentrate on designing additional phases of its proactive service plan. Developments in planning include the performance monitoring of DS1 systems carrying lower level services such as fractional T-1, DS0 and digital data service circuits. The use of DTMS to monitor these lower level systems would supplement the real-time digital cross-connect system alarm information currently being monitored by the NMC.

MCI move to ESF

MCI Communications Corp. began deploying ESF monitoring on customer circuits in 1988 when it developed its own ESF monitoring units.

MCI has been installing a second-generation ESF monitoring unit, developed last year, on all Terrestrial Digital Service (TDS) T-1 private lines ordered after Oct. 15, 1989. TDS 1.5 circuits are monitored 24 hours a day by MCI's network management system. Monitoring units are polled once every minute.

In addition to T-1 private-line circuit monitoring, MCI uses ESF to monitor the performance of the individual T-3 segments on its Digital Data Network (DDN), a digital subnetwork used to provision MCI digital and voice-grade private-line data circuits.

Every T-3 on the DDN has a dedicated T-1 channel for monitoring that T-3 section, enabling MCI to quickly isolate degradations on individual transmission line segments and extend the coverage and benefits of ESF monitoring to services below the T-1 level. Even where leased facilities are used, these facilities route through an MCI office on the far end of the circuit in all but a few cases, enabling the ESF monitoring units to be placed on the ends of the circuits.

MCI's ESF monitoring units use a proprietary synchronization and performance information segmentation protocol (SPISP). SPISP was specifically designed to support segment performance monitoring, enabling multiple ESF monitoring units to be placed on a single circuit.

The differences between the AT&T 54016 and MCI SPISP standards concern the messaging protocol on the FDL circuit. MCI's ESF monitoring units examine each message, and those that contain a different protocol pass through unaltered.

Thus, a user running end-to-end ESF using 54016 CSUs can poll their distant CSU without interference from MCI's ESF monitoring units. The messages conforming to the MCI SPISP format will be read and stored in the host computer for future access.

The ESF monitoring units allow MCI to observe the performance of the interoffice

channel, as well as that of the signal coming from the customer premises if the customer is also using ESF.

MCI is currently developing an upgrad-

by polling the CSU. The ESF monitoring units that MCI uses today do not communicate directly with customer CSUs for the 54016 and ANSI formats.

SPISP was specifically designed to support segment performance monitoring.



ed ESF monitoring unit that will enable the carrier to determine the user's received signal performance for the outgoing signal

In the first quarter of 1991, MCI is expected to implement new firmware that allows the ESF monitoring units to look at

the message on the FDL circuit and talk with the CSU on an AT&T 54016 basis. This will give MCI complete end-to-end and sectional performance visibility.

The new units are being designed to be compatible with CSUs using ANSI T1.403 standards as well. While the units are 54016- and ANSI-compatible, they will continue to use the MCI protocol.

Network engineers and technicians in every MCI operations center and network management center can view real-time and historical ESF performance information for every circuit and network link. This performance information has improved MCI's trouble management capabilities and resulted in better circuit performance and availability.

(continued on page 48)

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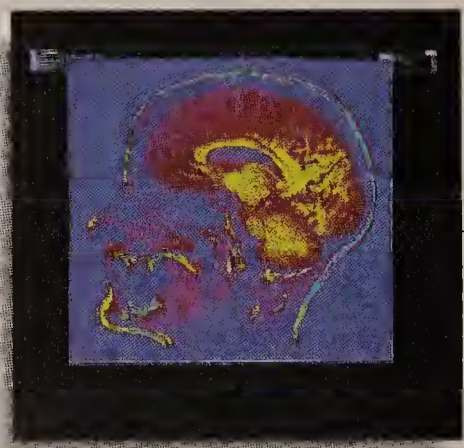
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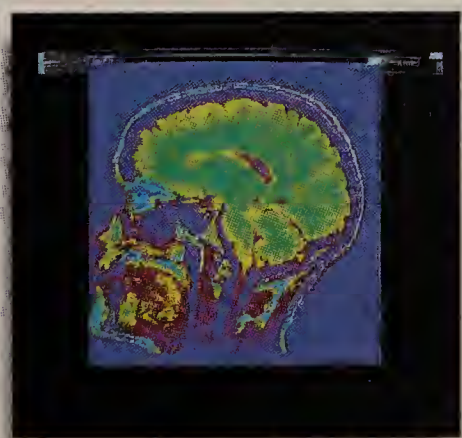
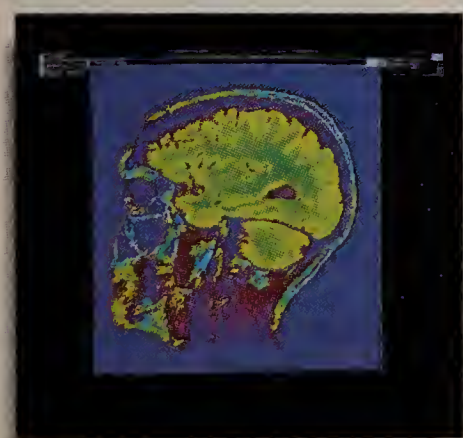
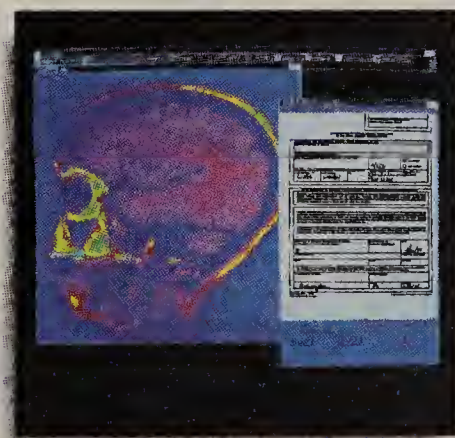
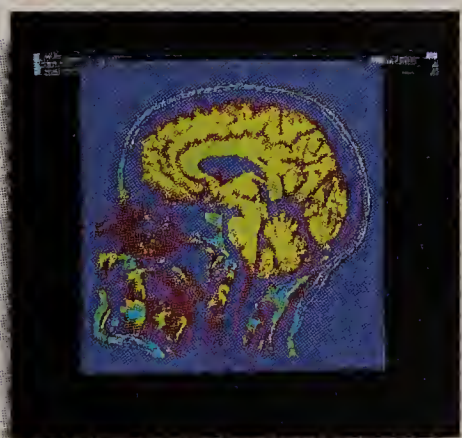
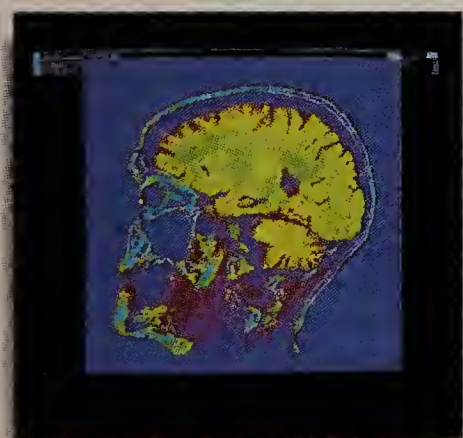
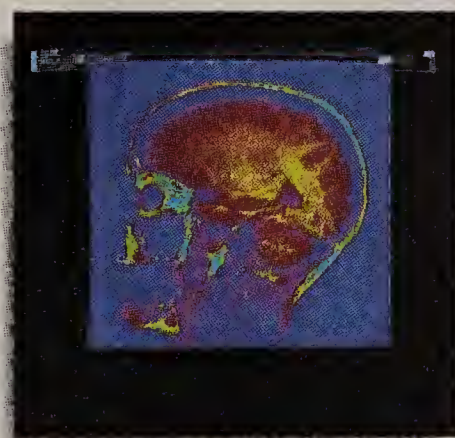
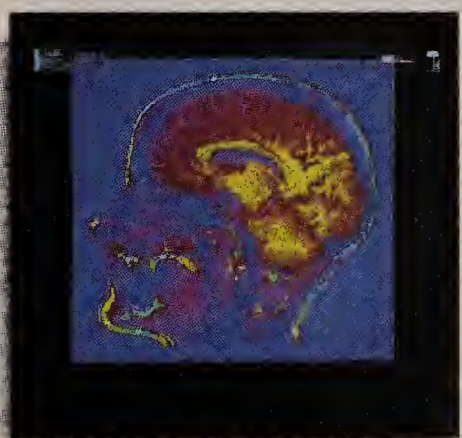
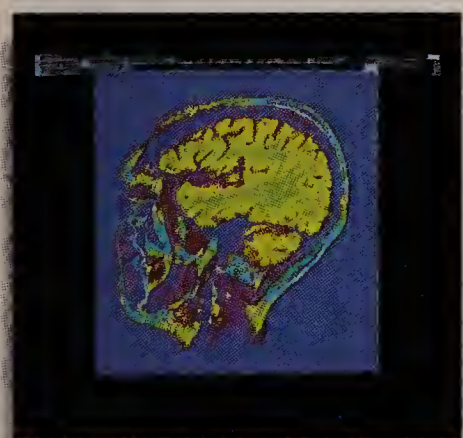
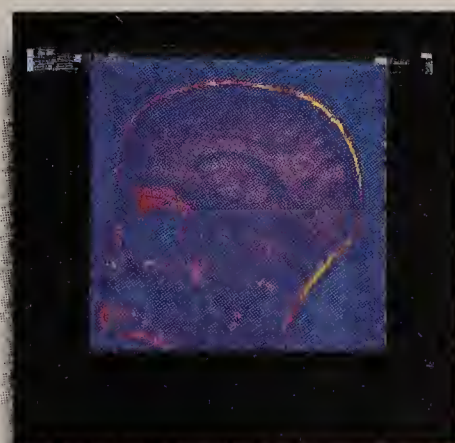
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(continued from page 45)

On a user-specific contracted basis, engineers monitor ESF information for user circuits to look for degradations in service so that proactive corrective action can be taken. MCI also does centralized end-to-end monitoring for users, on an individual case basis, including the polling of user CSUs.

Users have access to MCI ESF performance alarms via the MCI View interface to IBM's NetView. Users running NetView on their IBM mainframe can employ a NetView PC feed from the MCI View system.

The MCI View interface indicates the type, location and direction of the alarms. This interface will be enhanced in the future to pass raw cyclic redundancy check performance data, enabling users to cus-

tomize the information to work with their internal network management and reporting systems.

At last May's ICA conference, MCI announced a new ESF reporting capability, which will be available in the third quarter of 1990. MCI account teams will use a personal computer-based text reporting and graphics package to provide users with hard-copy ESF performance reports.

MCI is currently providing the reports to several large accounts. Information supplied includes errored seconds, severely errored seconds, out-of-frame errors, signal status and CRC-6 counts.

While MCI users can't access ESF information on-line at this time, MCI plans to begin providing all of its users with on-line access to ESF performance data in near

real time during the fourth quarter of 1991 as part of its Integrated Network Management Services strategy.

Information to be provided includes end-to-end performance and link performance (in other words, MCI point of presence to MCI point of presence and MCI point of presence to customer premises). MCI View provides alarm information but does not pass raw performance data. MCI plans to make proactive trouble management based on ESF performance data commercially available sometime in 1991 or 1992.

US Sprint gauges user needs

Now in the process of deploying ESF line monitoring units on its private-line network, US Sprint Communications Co.

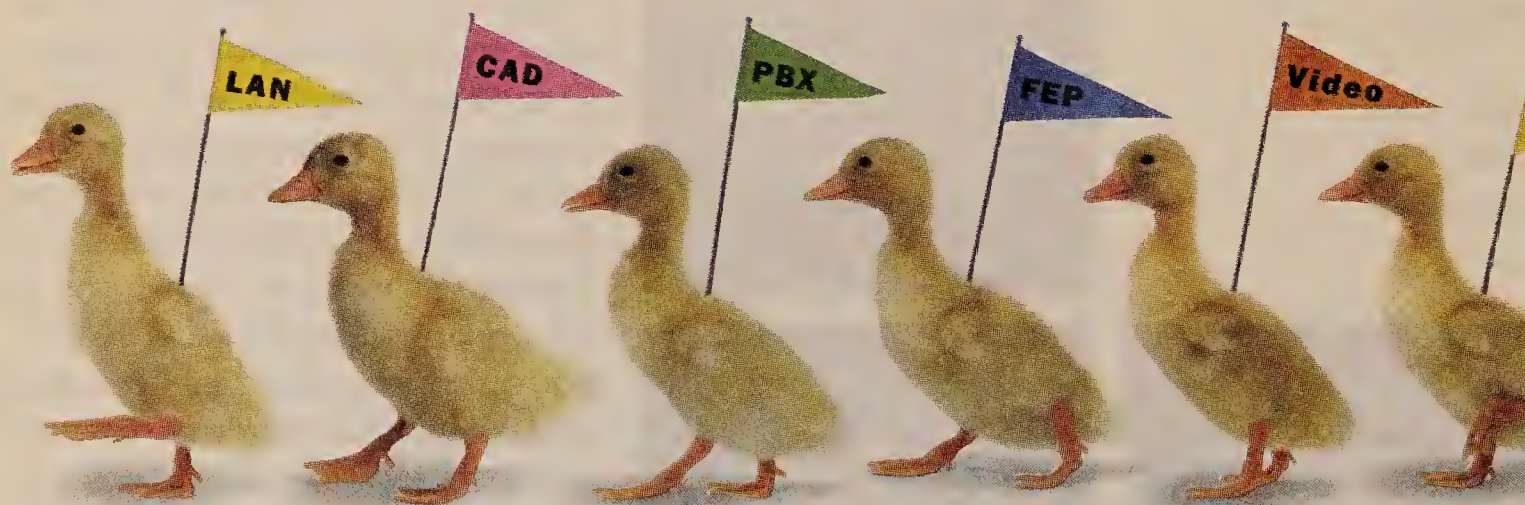
has been beta-testing its units at several user sites this summer. Like AT&T and MCI, US Sprint is initially putting ESF only on its interoffice private-line trunks.

US Sprint's current digital cross-connect network can transport the ESF CSU-originated format. The carrier is testing a monitoring system that uses the line monitoring units to check DS1 circuit performance.

US Sprint is also developing customer-oriented ESF programs, such as enhanced reports, which are expected to be introduced at the conclusion of the line monitoring unit tests in September. Meanwhile, the carrier will pass ESF formats and provide monitoring reports for its beta-test users at their request.

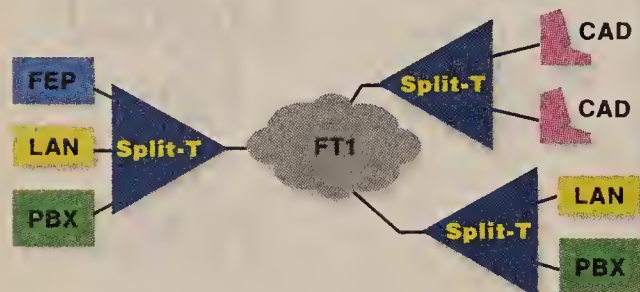
US Sprint will monitor ESF from the US Sprint Private Line Service Center in Atlanta, which monitors and maintains all of the carrier's Clearline digital circuits.

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Cable & Wireless

At present, Cable & Wireless Communications, Inc. also supports ESF in carrying customer-originated ESF signals. For the past two years, Cable & Wireless has been performing CRC-6 check-sum tests on cus-

Users should take account of carrier approaches to ESF reporting and support in the buying process.



tomers circuits routed through key nodal areas. The carrier has begun looking at proactive ESF and expects to start bringing some level of ESF functionality to its users by the end of the year.

Cable & Wireless intends to install more advanced sectionalized ESF testing capabilities, not just end to end, in 1991. It will store ESF information in registers to give users access to on-line or printed reports. The enhancements will be part of the carrier's customer network management package, which is now in beta test.

Once Cable & Wireless implements ESF throughout its private-line network and can successfully monitor ESF reporting, it will provide proactive customer line maintenance.

ESF is one of the few remaining enhancements available on private-line facilities. Therefore, users should take account of carrier approaches to ESF reporting and support in the buying process.

They should also gauge the overall effectiveness of the entire ESF reporting process to understand how their carrier will react when ESF-reported errors occur. Furthermore, when choosing a carrier, users should evaluate the carrier's network design support services in addition to bottom-line pricing and other service features.

The combination of up-front and ongoing support is critical to all private-line applications. With proper support up front, users will avoid many of the common non-carrier-related problems, such as synchronization. With ongoing ESF support, they will be able to reduce circuit downtime. **Z**

See The FAXNeT Form on Page 62

NETWORK WORLD
**BUDGET
SURVEY**

The ups and downs of communications budgets

CONTINUED FROM PAGE 1

In fact, companies may actually spend more on communications next year but divide it among more departments.

"I don't think organizations will be spending less [money]," says Barry Gilbert, a principal at TFS, Inc., a Westford, Mass.-based consulting and research firm that has been conducting

communications spending surveys and constructing industry spending models for six years.

"The costs will be more diversified within the operation. There is a lot more cost control and charging back of communications costs being implemented, particularly by large corporations," Gilbert adds.

About 32% of the survey re-

spondents indicate that their companies charge back all communications expenses to the departments. This is an increase from last year, when 27% charged back all expenses.

Additionally, 36.6% of the companies surveyed say departments have their own communications budgets. This is also an increase from last year, when only

28% of the respondents indicated that departments had their own communications budgets.

With more companies implementing chargeback programs, the amount budgeted by the department that manages a company's communications is decreasing — especially for local and long-distance telephone services. The average 1990 communications budget allocation for local and long-distance line charges was 25.5% — significantly lower than the 37.1% allocated in last year's budgets.

Companies have always charged back costs. Why are they, as the survey indicates, now doing it more often?

"When the economy starts to tighten, as it has in the past year or two, there is much more emphasis on how to control expenses in the organization," Gilbert explains.

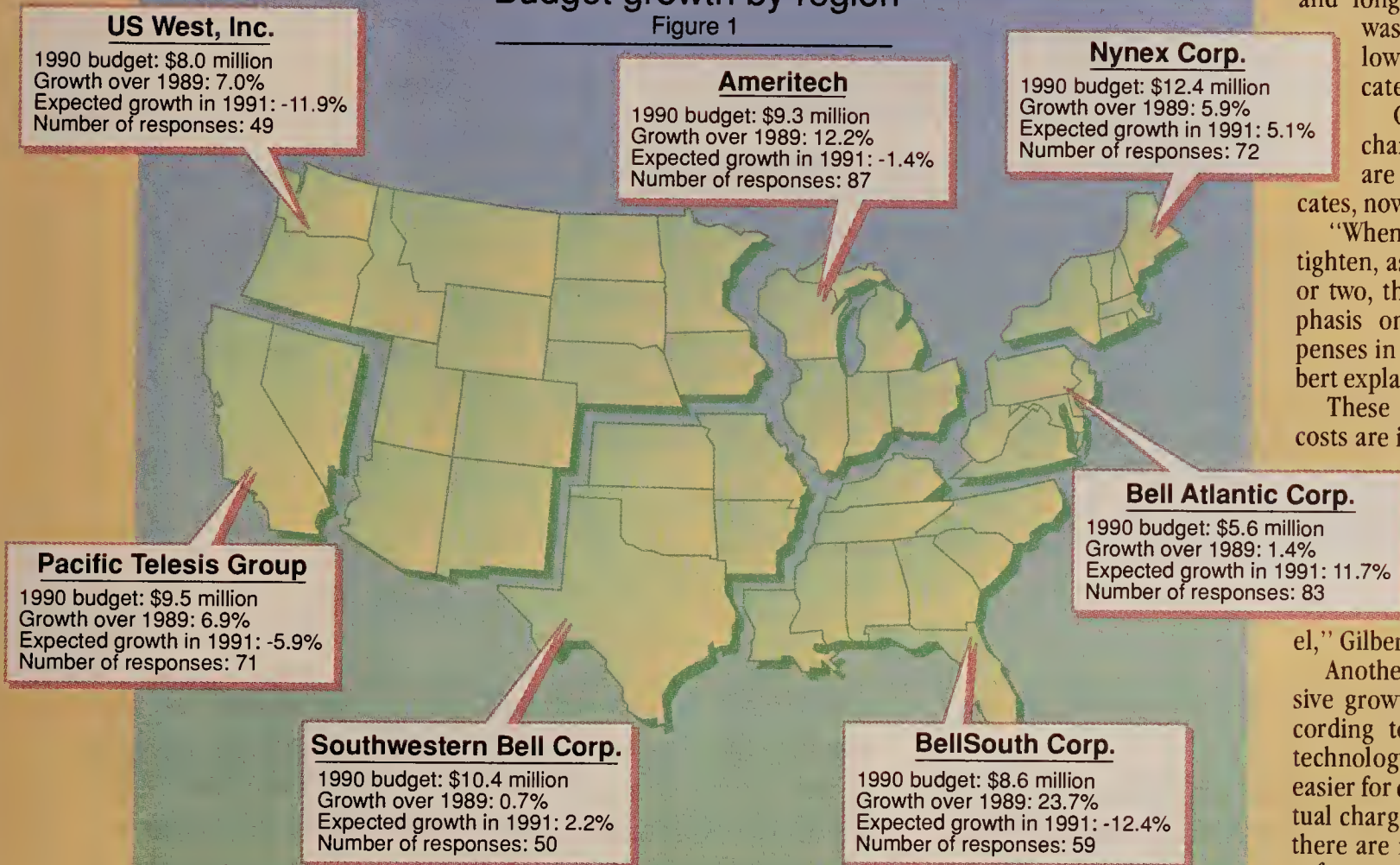
These efforts at controlling costs are increasing even though less than 1% of revenues are being allocated to communications. "Companies are attempting to monitor every nickel," Gilbert says.

Another reason for the extensive growth in chargebacks, according to Gilbert, is that the technology available makes it easier for companies to do the actual charging back. For example, there are many telemanagement software packages that allow

(continued on page 52)

Budget growth by region

Figure 1



GRAPHIC BY SUSAN SLATER

SOURCE: NETWORK WORLD AND TFS, INC., WESTFORD, MASS.

Network managers predict stagnation in their budgets as chargebacks and separate department budgets reduce corporate communications costs.

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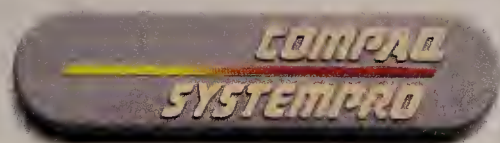
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COMPAQ

It simply works better.

(continued from page 49)

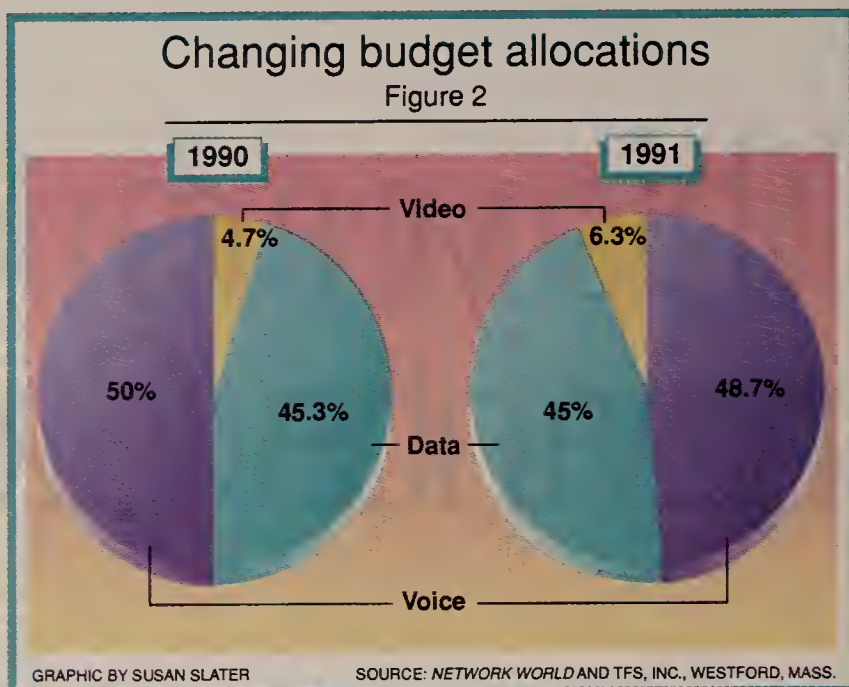
companies to do their own internal billing to departments. Additionally, the carriers are offering more extensive billing options — bills on a disk, for example — that make it easier for companies to control costs and bill the appropriate departments for telephone line charges.

Local and long-distance line charges are still the two largest items in the 1990 communications budget, accounting for a little more than 25.5% of the budget, followed by salaries, which account for about 23.1% (see figure, page 1). This means that in 1990, a large company, on average, will spend about \$2.12 million on salaries and another \$2.35 million on line charges.

In 1989, line charges accounted for 37.1% of the budget and salaries took up 19.4% of the budget. "Line charges may continue to drop somewhat next year, but we will not see a decrease in tariffs as we have in the past," Gilbert says.

About 41% of the line charges pay for local service, and the other 59% covers long-distance charges. Last year's numbers reflect essentially the same breakdown, with 61% going to long-distance charges and 39% allocated to local access charges.

AT&T still gets the lion's share of respondents' long-distance business — 60.5% of user company spending for long-distance services in 1990. MCI Communications Corp. has 20.6%, while US Sprint Communications Co. garners 11.2% of those dollars spent on long-distance services. All three gained about 2% in 1990, compared to spending data gathered in last year's *Network World* budget survey. This increase comes at the expense of all



other long-distance service providers, whose combined share dropped from 15.1% last year to 7.7% in 1990.

"This reinforces what other studies have shown: long-distance carriers — particularly AT&T — are regaining market share," Gilbert says. This trend is also supported by a recent report by the Federal Communications Commission ("FCC: AT&T is regaining lost ground," *NW*, Aug. 27).

Equipment is another large item in our managers' communications budgets. Respondents indicated that equipment purchases account for 11.8% of the budget, while equipment leasing eats up another 9.7%.

By year end, companies will have spent an average of \$1.1 million on equipment purchases and \$892,000 on equipment leases.

Last year, equipment accounted for 9.9% of the budget, and the amount allocated to equipment leases was 11%. The variations between the two years are within

the statistical fluctuations of the survey sample and, therefore, can be considered consistent.

Communications departments also allocated 7% of their 1990 budgets for equipment maintenance and another 6.4% for depreciation and amortization. That compares to last year's 7.1% for maintenance. The amount allocated to cover depreciation/amortization was not requested in last year's survey.

Other large items in the budgets include overhead (5.3%), travel (3.6%) and training (3.5%). About 4% of the budget covers miscellaneous services and consulting fees. These are all up slightly from last year, when overhead accounted for 4.3%, travel for 2.4% and training for 2.4%.

Buying big items

The capital budget is for major pieces of equipment, or network upgrades, that are often onetime expenditures. Roughly two-thirds (67.3%) of the respondents said they have a separate capital budget.

The fact is that all of the companies have capital budgets, but the control of the capital budget may not fall in the domain of the communications manager. It may fall under the chief financial officer or a financial department.

For those respondents indicating a separate capital budget within the communications department, the overall 1990 budget averaged \$9.875 million, with an average capital budget of about \$4.6 million. Companies with separate capital budgets under the control of the communications department tend to be larger so their average operating budgets are generally larger, according to Gilbert.

Voice vs. data

As is shown in Figure 2, the survey found that for 1990, the portion of the budget allocated to voice is about 50%; 45.3% is allocated for data, and 4.7% is for video. That means about \$4.6 million of a company's budget goes toward voice communications, about \$4.17 million toward data and only \$432,000 toward video.

While operating budgets grew 8% between 1989 and 1990, and will virtually remain at the 1990 level in 1991, the projection breakdown by voice, data and video remains about the same across the years. For example, in 1989, voice accounted for 51%, data for 44.5% and video for 4.5% of the communications budget. Survey respondents said next year's allocations will be 48.7% for voice, 45% for data and 6.3% for video. Videoconferencing, which has become more affordable due to lower line charges brought about by the use of dial-up vs. leased-line systems and dramatic reductions in the price of coder/decoders, is

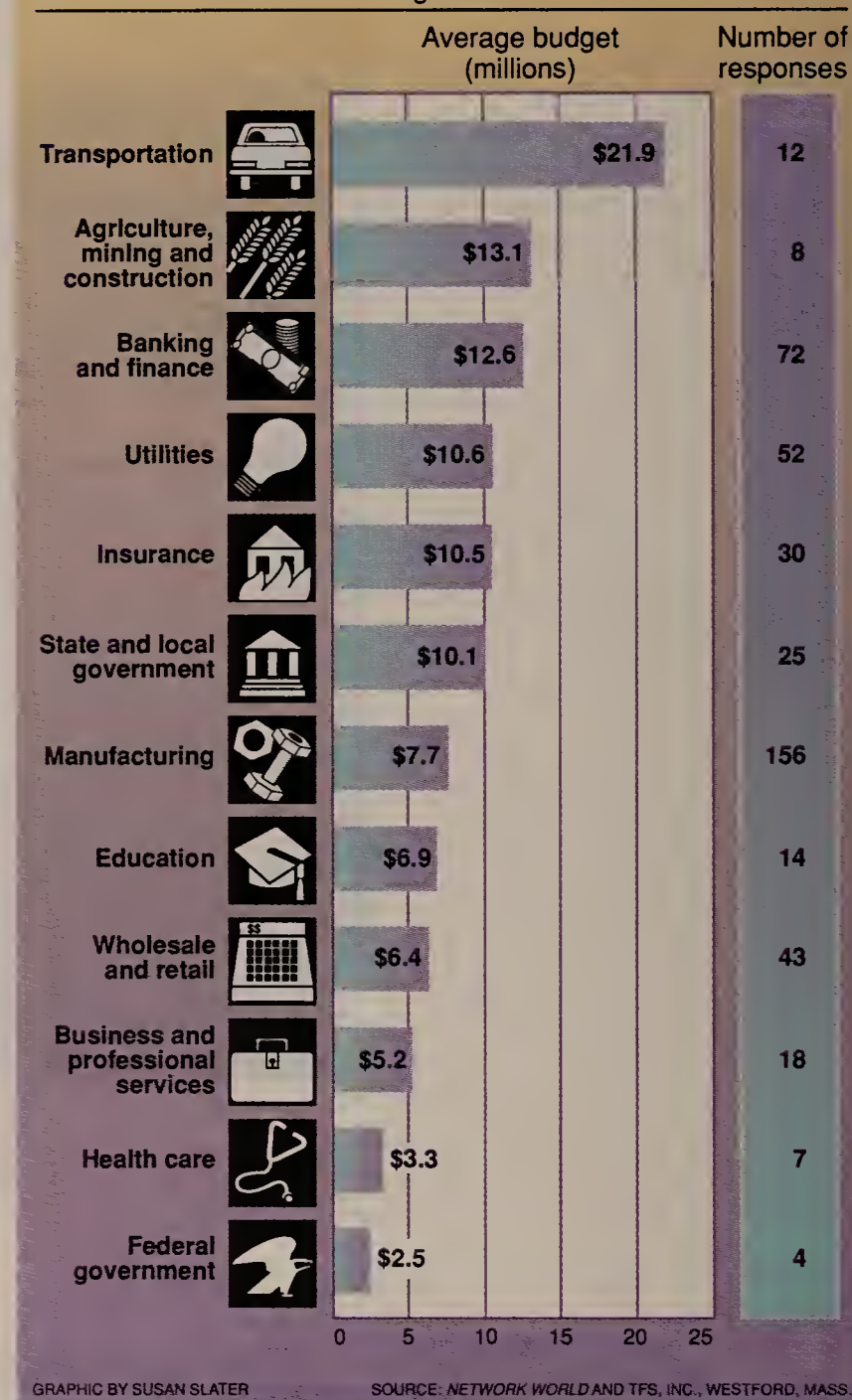
On the other hand, respondents from the transportation industry report that their average communications budgets total \$21.9 million, or more than double the survey's average. This amount was the highest average budget among all of the vertical industries (see Figure 3, this page, and Figure 4, page 89).

Transportation has always been a big user of communications services, according to Gilbert. Some of the reasons for this include the intense competition in the field and the need for firms to communicate over widely dispersed areas.

Gilbert notes that the industry

1990 communications budgets by industry

Figure 3



the primary video application that produced this nearly 50% increase in the portion of the budget allocated to video.

Vertical industry breakdown

Manufacturing, the industry with the largest proportion of respondents (31%), was found to have an average 1990 communications budget of \$7.7 million (see Figure 3). That's about \$1.5 million less than the survey's average of \$9.2 million (see Figure 4, page 89).

One possible reason for manufacturing's relatively low budgets is that a major segment of the manufacturing industry is the auto industry, which is in a recession.

is rife with communications-intensive operations, including airline reservation systems and trucking companies' freight tracking systems.

As a group, agricultural, mining and construction firms reported the second highest average communications budget, \$13.1 million. This was followed by banking and finance at \$12.6 million, utilities at \$10.55 million and insurance companies at \$10.5 million. Managers responsible for the communications of state or local governments, with average budgets of \$10.1 million, also had 1990 budgets above the survey's overall average of \$9.2 million.

(continued on page 89)

Survey methodology

The 1990 *Network World*/TFS, Inc. budget survey is based on 558 usable responses from a randomly selected sample of 2,500 communications managers chosen from *Network World's* subscriber list. This yielded a net response rate of 22%.

To gain a statistically representative sampling, company sites were chosen from many industries and regions. To investigate budget trends of leading-edge users of communications technology, organizational size parameters were used to ensure that larger sites were chosen.

The questions

In addition to direct questions about budgets, the survey asked about outsourcing, staffing and capital expenditures.

The information was collected using a disk-based survey questionnaire, a technique that TFS has used for its own re-

search. As respondents entered their answers to the questions, the information was stored on the 5¼-in. floppy disk.

A \$1 incentive was provided with each survey, along with a postage-paid disk mailer. As an added incentive to participate in the survey, those who returned a completed form were promised a copy of *Network World's* *Teletoons*, a collection of Phil Frank's and Joe Troise's best weekly cartoons.

All respondents remained anonymous. Each response provided about 70 data points for this budget study, and it took, on average, about 30 minutes for each respondent to complete the survey. That means readers contributed, in total, 279 hours (or about seven work weeks) to the project. *Network World* and TFS are extremely grateful to those who participated.

— Salvatore Salamone



**SOMETHING'S
WRONG WHEN
GETTING
TOO MANY CALLS
IS A BIGGER
PROBLEM
THAN GETTING
TOO FEW.**

**Introducing
Call Center Manager, For
Pacific Bell Centrex.**

THE REASON you want an incoming call center in the first place is that your business is thriving.

Yet too many call centers are so unwieldy and hard to manage that they still allow a frightening tangle of busy signals, cut-offs, interminable silences, or harried voices saying "Please hold" as if it were one word.

Results? Lost customers. Lost prospects. Lost revenue.

And then, if you dare to grow, you encounter the monstrous costs and complications of software and hardware upgrades, or even having to junk your whole system for a new one.

There is a solution.

Introducing Call Center Manager, for Pacific Bell Centrex. No other automated call distribution

system is nearly as flexible, or as easy to manage and use, as Pacific Bell Call Center Manager.

Of course, it swiftly, fluidly and efficiently distributes calls.

More important, it provides your managers with "real time," easy-to-read information in as little as *every three seconds* (as opposed to the typical 10 to 30 seconds), which lets you prioritize or reroute calls in immediate response to the changing flow of phone traffic.

Beyond that, it gives you precise reports on every single call (not just occasional snapshots of activity), to help you predict future call patterns.

Just how easy and flexible is Call Center Manager? Like the unique Centrex system itself, it's housed, monitored and maintained 24 hours every day at Pacific Bell's central offices. So it requires no switching equipment at your office.

You can order as few as two stations, and as many as—well, there's virtually no limit.

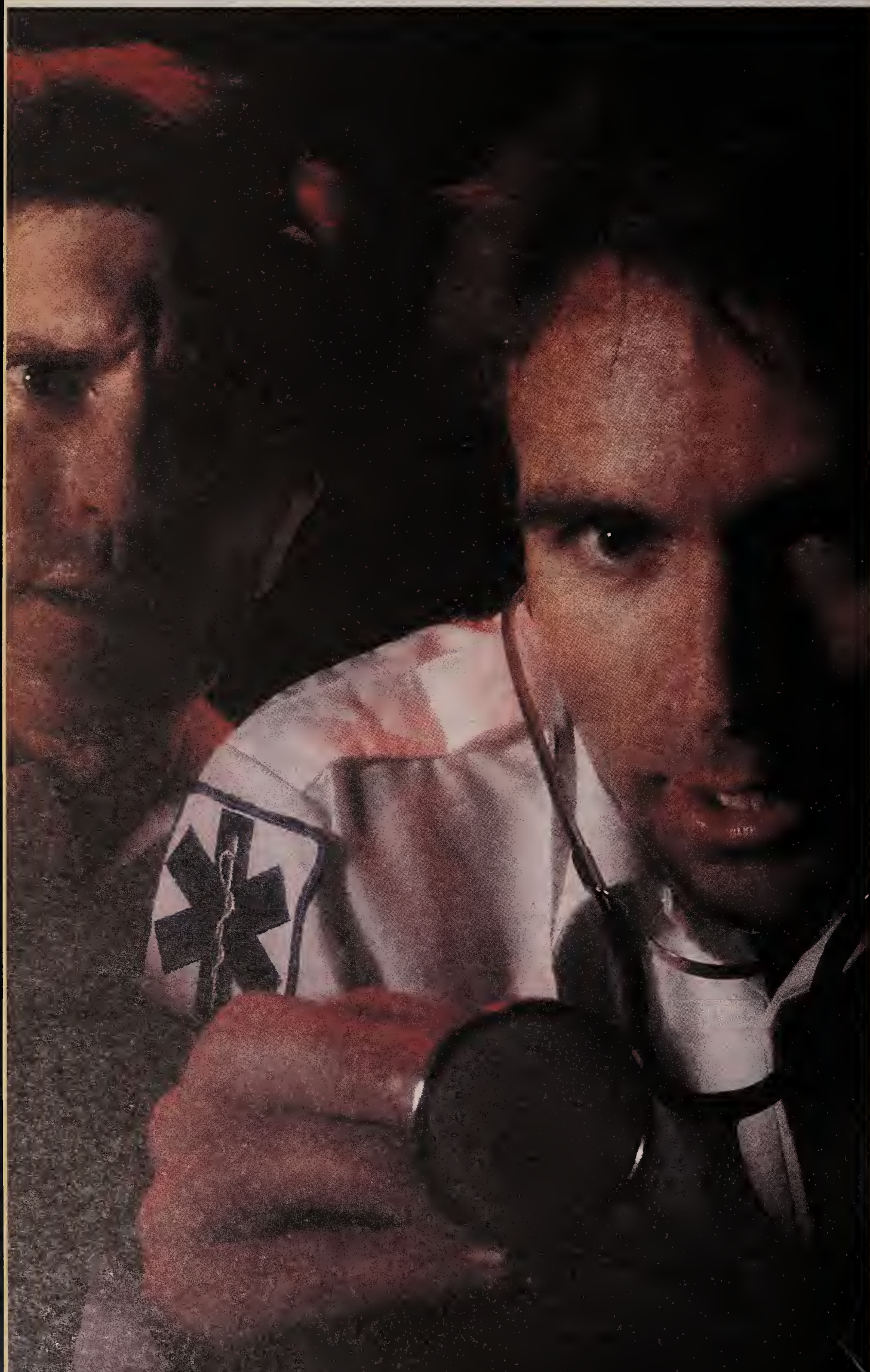
Also, you can add or subtract stations as often as you want, to reflect seasonal, monthly or even daily needs. *And you pay only for the capacity you're using at the time.*

Call Center Manager is available only to users of the Pacific Bell Centrex system. So if your business depends on the telephone, call your Account Executive or 1-800-PAC-BELL, extension 334 for more information.

Because while Centrex has always been the only phone system that allows unlimited growth, with Call Center Manager, it's now the only system that actually encourages it.

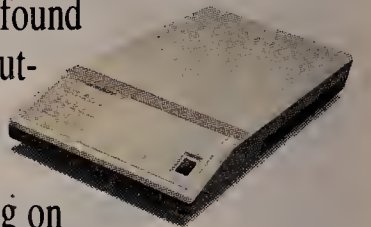
**We're making
things easier.**

NEC modems keep information moving as if your life depends on it.



In a 911 emergency, to risk a communications breakdown is to risk a life. So if you don't want to take any chances, make sure your modem can handle the pressure in a crisis.

In Florida, NEC's I Series Intelligent Chassis System is now helping coordinate the life-saving efforts of Lake County's 911 services. The county chose the system after tests found NEC's I-Chassis modems outperformed others. And they've proved their round-the-clock reliability by being on the job there for more than a year without a single failure.



Since NEC modems are designed to rapidly and accurately transmit huge volumes of data, Lake County's 911 operators can now quickly pinpoint accident locations, provide traffic instructions, find patient medical records, and dispatch back-ups when needed. And because NEC's Dual Modem Card links 911's control center to NEC Dial-up Modems in remote locations, Lake County feels it has found the best data networking solution attainable.

Each individual I Series Chassis supports a wide variety of applications and products. These include synchronous and asynchronous operation in dial-up or leased line networks. Line speeds ranging from 300 bits/s to 56k bits/s with both analog and digital capabilities. As well as compatibility with CCITT standards such as V.32 and V.42/bis. Plus,

the system's built-in flexibility eliminates product obsolescence by making it easy to add, mix, and match other chassis and data communications devices as network requirements change.

No matter what business you're in, you need a modem that can keep facts and information on the move without causing a crisis of confidence. So choose wisely. Choose NEC's I Series Intelligent Chassis System and Network Manager. For a free assessment of all your data networking needs, call (800) 222-4NEC.



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BUYER'S



GUIDE

FRACTIONAL
T-1 MUXES

Fractional T-1 services spur mux growth

CONTINUED FROM PAGE 1

sport some of the greatest fractional T-1 functionality.

The market niche for fractional T-1 applications generally involves links that are greater than 500 miles in length and less than one-half the capacity of a T-1. If a user requires half of a T-1 line and the nodes are close together, the extra cost of getting a full T-1 typically is worth it. Sixty percent of T-1 spans are less than 300 miles long.

Defining fractional T-1

As with many long-distance services, the carriers have failed to reach a consensus on what actually defines a fractional

Briere is president of TeleChoice, Inc., a Montclair, N.J., telecommunications consultancy specializing in long-distance service competitive analysis and network design.

T-1 service. Some are selling transmission capacity in 56K and 64K bit/sec increments; others are offering only 56K or 64K bit/sec service.

CHART • GUIDE

A chart comparing different fractional T-1 equipment begins on page 56, and a chart comparing the features of fractional T-1 equipment begins on page 64.

On a conceptual level, it makes sense to define fractional T-1 at the 64K bit/sec level since that conforms to the major component of the T-1, the DS0 channel. Yet it is popular to include 56K bit/sec in the definition as well, largely because of the number of 56K bit/sec digital data ser-

(continued on page 67)

Net managers face the challenge of deciding whether to buy a DSU/CSU or a fractional T-1 multiplexer

Fractional T-1 equipment (continued on page 58)

Vendor	Product	Product type	Fractional T-1 transmission supported	Input supported	Configurations supported	Transmission facilities supported	Physical fractional T-1 ports supported	Inter-leaving	AT&T tested	Logical links per physical interface	Logical fractional T-1 bundles that can be multiplexed onto T-1 aggregate (with/without embedded supervisory channel)	T-1 and E-1 fractional service support	Diagnostic and test capabilities	Price range/average price
Astrocom Corp. St. Paul, Minn. (612) 227-8651	NX2 2-Port Fractional T-1 Multiplexer	DSU/CSU/Multiplexer	Dedicated	Data, image, video	Point to point, drop and insert	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair	1	Byte	No	2 (3 with optional DS1 interface)	2/2	T-1 only	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line	\$3,395/\$3,395
	NX6456 4-Port Fractional T-1 Multiplexer	DSU/CSU/Multiplexer	Dedicated	Data, image, video	Point to point, drop and insert	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair	1	Byte	Yes	4 (5 with optional DS1 interface)	4/4	T-1 only	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line	\$4,500 to \$6,000/\$5,200
	NX1 T-1/Fractional T-1 DSU/CSU	DSU/CSU	Dedicated	Data, image, video	Point to point, drop and insert	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair	1	Byte	Yes	1 (2 with optional DS1 interface)	1/1	T-1 only	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line	\$1,995 to \$2,995/\$2,495
AT&T Paradyne Largo, Fla. (800) 482-3333	AccuLink 740/741/745	Multiplexer	Dedicated	Voice, data, image, video	Point to point, multipoint, ring, tandem, drop and insert, bypass, mesh, single end access	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic	As many as 16 on Acculink 745; one fully redundant on 740 and 741	Byte; bit optional for channel bundling	Yes	24	24/24	T-1 only	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$8,650 to \$59,800/\$12,750
Canoga-Perkins Chatsworth, Calif. (818) 718-6300	3140 Voice/Data Multiplexer	Multiplexer	Dedicated	Voice, data, image, video	Point to point, multipoint, ring, drop and insert, bypass	Fractional T-1/DS1, T-1/DS1, microwave, satellite, fiber optic, twisted pair	2	Byte	No	1	1/1	Yes	Test pattern diagnostics	Not available/\$5,000
CASE/Datatel, Inc. Cherry Hill, N.J. (800) 424-4451	DCP9900	Nodal processor	Switched, dedicated	Voice, data, image, video	Point to point, multipoint, ring, tandem, drop and insert, bypass, mesh	Fractional T-1/DS1, T-1/DS1, microwave, satellite, fiber optic, twisted pair	10	Byte	Yes	1	24/24	Yes	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$16,500 to \$40,000/\$30,000
	DCP9100	Multiplexer	Switched, dedicated	Voice, data, image, video	Point to point, tandem, drop and insert, bypass	Fractional T-1/DS1, T-1/DS1, microwave, satellite, fiber optic, twisted pair	1	Byte	Yes	1	24/24	No, fractional T-1 only	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$4,400 to \$9,500/\$6,500
	DCP9401	Multiplexer	Switched, dedicated	Voice, data, image, video	Point to point, drop and insert, bypass	Fractional T-1/DS1, T-1/DS1, microwave, satellite, fiber optic, twisted pair	1	Byte	Yes	1	24/24	No, fractional T-1 only	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$4,200 to \$8,000/\$5,500
	DCP3555	DSU/CSU	Switched, dedicated	Voice, data, image, video	Point to point, drop and insert	Fractional T-1/DS1, T-1/DS1, microwave, satellite, fiber optic, twisted pair	1	Byte	Yes	1	Provides user with one synchronous interface and one DS-1 interface	Fractional T-1 and T-1 only	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$3,175/\$3,175
Coastcom, Inc. Concord, Calif. (415) 825-7500	D/I MUX III Intelligent Channel Bank	CSU	Switched, dedicated	Voice, data	Point to point, ring, tandem, drop and insert	Fractional T-1/DS1, T-1/DS1, microwave, satellite, fiber optic, twisted pair	2	Byte	Yes	1	Not applicable/1 to 24	T-1 only	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line	\$3,000 to \$4,940/\$3,800
Codex Corp. Mansfield, Mass. (800) 426-1212	6232	Channel Bank	Dedicated	Voice, data, image, video	Point to point	Fractional T-1/DS1, T-1/DS1, microwave, satellite	1	Byte	No	1	1/1	T-1 only	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line	\$4,000 to \$12,000/\$7,000
Dataproductions of New England, Inc. Wallingford, Conn. (203) 265-7151	DPMUX-FT1	Multiplexer	Dedicated	Voice, data, image, video	Point to point, tandem	Fractional T-1/DS1, T-1/DS1, microwave, satellite, fiber optic, twisted pair	16 time-division multiplexers, 32 statistical time-division multiplexers (as statistical multiplexers)	Byte, with N x 50 bit/sec resolution	No	1	1/1	Yes	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line	\$4,000 to \$9,000/\$5,000

CSU = Channel service unit
DDS = Digital data service

DSU = Data service unit
PRI = Primary Rate Interface

FOOTNOTES:
(1) Some of above configurations are supported when fractional T-1 access is used in conjunction with IDNX Transmission Resource Manager.
(2) The architecture of the 1564 allows peripheral Phoenix equipment to be attached via a bus connection into the T-1 media. This allows Phoenix to provide integrated devices such as the 1565 Subrate Digital Mux (20 ports per 1565).

This chart includes a representative selection of vendors in the fractional T-1 multiplexer market. Most vendors offer other fractional T-1 multiplexers, and many vendors not included offer a full range of competitive products.

SOURCE: TELECHOICE, INC., MANCHESTER, CONN.



There's only one PBX system that won't be blown away by the future.



When the future comes knocking, only one PBX has both the flexible architecture and power to answer the challenge. The Fujitsu F9600.™ Unlike others who've retrofitted older PBXs, the F9600 was designed from the start to take advantage of emerging telecommunication services — like ISDN and broadband. For starters, its distributed processor architecture lets you add capacity and functionality simply by adding processor modules. Its single stage switching matrix provides smooth growth and fast processing of voice, data and, when you need it, broadband services such as video. And thanks to its high-level applications-oriented software, new applications can be added as quickly as your needs change. Today, the system is performing worldwide in over 1,300 installations. Which shouldn't come as a surprise, considering Fujitsu Ltd. is a pioneer in ISDN technology and an \$18 billion global leader in computers and telecommunications. To see just how much better the F9600 really is, call Fujitsu Business Communication Systems at 1-800-654-0715. You'll find that with the F9600, the future's nothing to be afraid of.

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See The FAXNeT Form on Page 62

Fractional T-1 equipment (continued on page 60)

Vendor	Product	Product type	Fractional T-1 transmission supported	Input supported	Configurations supported	Transmission facilities supported	Physical fractional T-1 ports supported	Inter-leaving	AT&T tested	Logical links per physical interface	Logical fractional T-1 bundles that can be multiplexed onto T-1 aggregate (with/without embedded supervisory channel)	T-1 and E-1 fractional service support	Diagnostic and test capabilities	Price range/average price
Digital Link, Inc. Sunnyvale, Calif. (408) 745-6200	DL55/VX-FT	DSU/CSU	Dedicated	Data	Point to point, multipoint, bypass	Fractional T-1/DS1, T-1/DS1, twisted pair	1	Both bit and byte (hybrid device)	Yes	2	2/2	T-1 only	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$3,495/\$3,495
	DL 100 Digital Service Multiplexer	DSU/CSU	Dedicated	Data	Point to point, multipoint, drop and insert, bypass	Fractional T-1/DS1, T-1/DS1, twisted pair	1	Byte	In progress	6	6/6	T-1 only	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$3,695 to \$5,495/not available
General DataComm, Inc. Middlebury, Conn. (203) 574-1118	MEGAMUX TMS	T-1 multiplexer	Switched, dedicated	Voice, data, image, video, LAN	Point to point, multipoint, ring, tandem, drop and insert, bypass, mesh, ISDN PRI	Fractional T-1/DS1, T-1/DS1, microwave, satellite, fiber optic, twisted pair, ISDN PRI, E-1/G.732, G.704	30	Both bit and byte (hybrid device)	Yes	T-1: 24; E-1: 30	24/24	Yes	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$10,000 + / configuration dependent
Hubbell, Inc. Pulsecom Division Herndon, Va. (703) 471-2950	T-1 BusinessBank	Fractional T-1, T-1 and T-1C multiplexers	Switched, dedicated	Voice, data, image, video	Point to point, tandem, bypass; compatible with multipoint, ring, drop and insert, and mesh configurations	Fractional T-1/DS1, T-1/DS1, microwave, satellite, fiber optic, twisted pair, multimode and single mode fiber, T1C	2	Byte	Yes	As many as 20 per DS0 for data; as many as 48 per DS1	1 to 24/1 to 24	T-1 only	Logical fractional T-1 bundle diagnostics (DDS diagnostics); loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$2,650 to \$7,500/\$6000
Infotron Systems Corp. Cherry Hill, N.J. (800) 926-9600	NX4600, NX3200, NX3000	Multiplexer	Dedicated	Voice, data, image, video	Point to point, multipoint, ring, tandem, drop and insert, bypass, mesh	Fractional T-1/DS1, T-1/DS1, microwave, satellite, fiber optic, twisted pair	20 non-blocked per node	Byte	Yes	T-1: 24; E-1: 30	24/24	Yes	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line	\$11,020 to \$150,000/\$31,500
Intraplex, Inc. Littleton, Mass. (508) 486-3722	Variable Rate Multiplexer	Multiplexer	Dedicated	Voice, data, video, program audio	Point to point, multipoint, ring, tandem, drop and insert	Fractional T-1/DS1, T-1/DS1, microwave, satellite, fiber optic, twisted pair, coaxial cable	1 DS0 (any number of coding/multiplexing input modules can be accommodated up to a capacity of 24 DS0s. The output is variable up to a maximum of 1.544M bit/sec)	Byte	Yes	24	23/24	Yes	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$3,000 to \$4,000/\$3,000
Larse Corp. Santa Clara, Calif. (408) 988-6600	Split-T	DSU/CSU	Dedicated	Voice, data, image, video	Point to point, multipoint, drop and insert	Fractional T-1/DS1, T-1/DS1	1	Byte	Yes	3 (2 Data Terminal Equipment and 1 drop and insert)	Not applicable/24	T-1 only	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$3,500 to \$4,500/\$4,000
Micom Communications Corp. Simi Valley, Calif. (800) 642-6687	Marathon 5K	Multiplexer	Dedicated	Voice, data, image, fax	Point to point, multipoint, ring, drop and insert, bypass, mesh, star, tandem	Fractional T-1/DS1, microwave, satellite, twisted pair, fiber optic	1 or 2	Fast packet multiplexing scheme, byte	No, tested with AT&T circuits	5, using fast packet multiplexing	2/2	Yes	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$3,000 to \$10,000/\$6,000
Network Equipment Technologies, Inc. Redwood City, Calif. (415) 366-4400	IDNX/10	Access Multiplexer	Dedicated	Voice, data, image, video	Multipoint, ring, tandem, drop and insert, bypass	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic	2 (one active, one hot standby)	Byte	Yes	23	16/23	Yes	Logical fractional T-1 bundle diagnostics	\$8,000 to \$25,000/not available
	FT1 Access DSU/CSU	DSU/CSU	Dedicated	Voice, data, image, video	Point to point, multipoint, ring, tandem, drop and insert, bypass, mesh	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic	1	Byte	Yes	2	1 or 2/24	Fractional T-1 only	Logical fractional T-1 bundle diagnostics	\$5,000 to \$8,500/not available

CSU = Channel service unit
DDS = Digital data service

DSU = Data service unit
PRI = Primary Rate Interface

FOOTNOTES:

- (1) Some of above configurations are supported when fractional T-1 access is used in conjunction with IDNX Transmission Resource Manager.
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SOURCE: TELECHOICE, INC., MANCHESTER, CONN.

Now Is No Time To Discover That Your Digital Network Doesn't Have Dial Back-Up.

Even the very best digital service is a bit of a gamble. Because none can guarantee 100% uptime.

So who can offer the digital solution that's closest to perfection?

ONLY GDC CAN.

Our new 500C family of DSU's is designed to take full advantage of the cost/performance benefits of digital service.

Consider our 500C/DBU. It incorporates a V.32 compliant Dial Back-Up unit for the ultimate in uptime and reliability.

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The entire 500C family operates at multiple speeds; in synchronous or asynchronous modes. And all our DSU's are upgradeable for full network management, so your network won't ever become obsolete.

Further, GDC's exclusive DataCommonality allows you to mix and match analog and digital data sets (including intelligent T-1 CSU's) in the same space-saving racks.

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 **General DataComm**

Fractional T-1 equipment (continued on page 63)

Vendor	Product	Product type	Fractional T-1 transmission supported	Input supported	Configurations supported	Transmission facilities supported	Physical fractional T-1 ports supported	Inter-leaving	AT&T tested	Logical links per physical interface	Logical fractional T-1 bundles that can be multiplexed onto T-1 aggregate (with/without embedded supervisory channel)	T-1 and E-1 fractional service support	Diagnostic and test capabilities	Price range/average price
Network Equipment Technologies, Inc. (continued)	IDNX/20, IDNX/40, IDNX/70	Multiplexers	Dedicated	Voice, data, image, video	Point to point, multipoint, ring, tandem, drop and insert, bypass, mesh (1)	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic (1)	IDNX/20: as many as 16; IDNX/40: as many as 16; IDNX/70: as many as 96	Byte	Yes	IDNX/20: 15; IDNX/40: 15; IDNX/70: 96	1/24	Yes	Logical fractional T-1 bundle diagnostics	IDNX/20: \$14,000 to \$55,000/not available; IDNX/40: \$35,000 to \$75,000/not available; IDNX/70: \$60,000 to \$350,000/not available
Newbridge Networks, Inc. Herndon, Va. (703) 834-3600	Mainstreet 3600	Multiplexer	Switched, dedicated	Voice, data, image, video	Point to point, multipoint, ring, tandem, drop and insert, bypass, mesh	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic	32	Both bit and byte	Yes	24	24/24	Yes	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$6,500 to \$30,000/\$15,000
Phoenix Microsystems, Inc. Huntsville, Ala. (800) 866-8480	1564 FT-1 Gateway, Data-T	DSU	Dedicated, T-1 switched devices (not DDS)	Voice (digitized), data, image, video	Point to point, multipoint, ring, tandem, drop and insert, bypass, mesh	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic, Digital Signal Cross-Connect levels	3	Byte	Yes	As many as 320 links	16/16 (2)	T-1 only	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$995 to \$6,500/\$3,295
Racal-Milgo Sunrise, Fla. (800) 722-2555	Omnimux 9000	Multiplexer	Dedicated	Voice, data, image, video	Point to point, multipoint, ring, tandem, bypass, mesh	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic	16	Byte	No	Offnet, as many as 24	1/24	T-1 only	Logical fractional T-1 bundle diagnostics	\$20,000 to \$100,000/\$60,000
	Omnimux 8000	Multiplexer	Dedicated	Voice, data, image, video	Point to point, multipoint, ring, tandem, drop and insert, bypass, mesh	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair	768	Nibble	In process	24	1/24	T-1 only	Logical fractional T-1 bundle diagnostics	\$15,000 to \$50,000/\$30,000
	Omnimux 7000I	Access Multiplexer	Dedicated	Voice, data, image, video (as many as 1.536M bit/sec)	Point to point	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair	1	Byte	Yes	24	Not applicable	No	Test pattern diagnostics	\$2,900 to \$35,000/not available
RAD Data Communications, Inc. Rochelle Park, N.J. (201) 587-8822	FCD-1	DSU/CSU	Dedicated	Data, video	Point to point, multipoint, ring, drop and insert, bypass, mesh	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic	1	Byte	No	1	Not applicable, one channel DSU/CSU	No, will implement in response to user requests	Test pattern diagnostics	\$1,250 to \$2,000/\$1,625
Republic Telecom Systems Corp. Boulder, Colo. (800) 822-6227	RNET Networking System	Multiplexer	Switched, dedicated	Voice, data, image	Point to point, multipoint, tandem, bypass, star	Fractional T-1/DS1, microwave, satellite, twisted pair, fiber optic	16 per tandem switch	Packet multiplexing scheme	Tested for 64 kilobits, 128 kilobits	10	10 voice channels per DS0, or mix of voice, fax and data	Yes	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line	\$19,000 to \$21,000 per network node, \$11,000 per Network Control System, \$40,000 to \$80,000 per RNET Tandem Switch/not available
Scitec Communications Systems, Ltd. Middletown, R.I. (401) 848-4353	Integrator 1500	DSU	Dedicated	Data	Point to point, multipoint	Fractional T-1/DS1, T-1/DS1, microwave, twisted pair	1	Bit	No	1	0/2	Yes	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line	\$2,000 to \$3,500/\$2,800

CSU = Channel service unit
DDS = Digital data service

DSU = Data service unit
PRI = Primary Rate Interface

FOOTNOTES:

- (1) Some of above configurations are supported when fractional T-1 access is used in conjunction with IDNX Transmission Resource Manager.
(2) The architecture of the 1564 allows peripheral Phoenix equipment to be attached via a bus connection into the T-1 media. This allows Phoenix to provide integrated devices such as the 1565 Subrate Digital Mux (20 ports per 1565).

This chart includes a representative selection of vendors in the fractional T-1 multiplexer market. Most vendors offer other fractional T-1 multiplexers, and many vendors not included offer a full range of competitive products.

SOURCE: TELECHOICE, INC., MANCHESTER, CONN

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- ☐ One Site
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Fractional T-1 equipment (continued on page 90)

Vendor	Product	Product type	Fractional T-1 transmission supported	Input supported	Configurations supported	Transmission facilities supported	Physical fractional T-1 ports supported	Inter-leaving	AT&T tested	Logical links per physical interface	Logical fractional T-1 bundles that can be multiplexed onto T-1 aggregate (with/without embedded supervisory channel)	T-1 and E-1 fractional service support	Diagnostic and test capabilities	Price range/average price
Scitec Communications Systems, Ltd. (continued)	IDM-FT1	DSU	Dedicated	Voice, data, image, video	Point to point	Fractional T-1/DS1, T-1/DS1, microwave, twisted pair	1	Byte	Yes	1	3/4	No	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line	\$3,000 to \$6,400/\$5,500
StrataCom, Inc. Campbell, Calif. (408) 370-2333	FastPacket IPX	Multiplexer	Dedicated	Voice, data, image, video	Point to point, multipoint, ring, tandem, drop and insert, bypass, mesh	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic	30	Fast packet multiplexing scheme	No, scheduled fourth quarter 1990	1	1/1	Yes	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$9,000 to \$150,000/\$75,000
Telco Systems Network Access Corp. Fremont, Calif. (415) 490-3111	Route-FT1	Access Multiplexer	Dedicated	Voice, data, image, video	Point to point, multipoint, ring, tandem, drop and insert, bypass	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic	11	Byte	Yes	24	24/24	No	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line	\$6,538 to \$15,538/\$6,538
Telecommunications Technologies, Inc. Milpitas, Calif. (408) 945-7904	INPATH	DSU/CSU/T-1 multiplexer	Switched, dedicated	Voice, data	Point to point, multipoint, ring, tandem, drop and insert, bypass	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic	1	Both bit and byte	Yes	2	Any combination, as many as 24	No	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	Not available
Telematics International, Inc. Fort Lauderdale, Fla. (305) 772-3070	Digital Wideband Exchange	Multiplexer	Dedicated	Voice, data, image, video	Point to point, multipoint, ring, tandem, drop and insert, bypass, mesh	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic	8	Bit	No	7	7/7	Yes	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line	\$10,000 to \$150,000/\$65,000
Teleprocessing Products, Inc. Simi Valley, Calif. (805) 522-8147	TP-9000 FT-1 MUX	Multiplexer	Dedicated	Data	Point to point, multipoint, ring, tandem, drop and insert, bypass	Fractional T-1/DS1, T-1/DS1, twisted pair	As many as 8, or as many as 7 plus 1 drop and insert card	Byte	No, scheduled for September	8	8/8	T-1 only	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line	\$4,000 to \$10,000/not available
Tellabs, Inc. Lisle, Ill. (708) 969-8800	Crossnet	Multiplexer	Dedicated	Voice, data, image, video	Multipoint, ring, tandem, drop and insert, bypass, mesh	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic	1 to 16	Both bit and byte	Yes	24	24/24	Yes	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$6,400 to \$50,000/\$9,700
Teltrend, Inc. St. Charles, Ill. (800) 835-8736	M-826 MAXI	Multiplexer/CSU	Dedicated	Voice, data, image, video	Point to point, multipoint, ring, tandem, drop and insert, bypass	Fractional T-1/DS1, T-1/DS1	2	Byte	Yes	24	24/24	T-1 only	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$6,500 to \$40,000/\$9,500
Timeplex, Inc. Woodcliff Lake, N.J. (201) 391-1111	microLINK/2+	Multiplexer	Switched, dedicated	Voice, data, image, video	Point to point, ring, tandem, drop and insert, bypass, mesh	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic	4	Byte	Yes	48	3/24	Yes	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$7,500 to \$12,800/\$10,000
	miniLINK/2+	Multiplexer	Switched, dedicated	Voice, data, image, video	Point to point, ring, tandem, drop and insert, bypass, mesh	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic	7	Byte	Yes	208	6/24	Yes	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$10,000 to \$20,000/\$15,000

CSU = Channel service unit
DDS = Digital data service

DSU = Data service unit
PRI = Primary Rate Interface

FOOTNOTES:
(1) Some of above configurations are supported when fractional T-1 access is used in conjunction with IDNX Transmission Resource Manager.
(2) The architecture of the 1564 allows peripheral Phoenix equipment to be attached via a bus connection into the T-1 media. This allows Phoenix to provide integrated devices such as the 1565 Subrate Digital Mux (20 ports per 1565).

This chart includes a representative selection of vendors in the fractional T-1 multiplexer market. Most vendors offer other fractional T-1 multiplexers, and many vendors not included offer a full range of competitive products.

SOURCE: TELECHOICE, INC., MANCHESTER, CONN

Fractional T-1 equipment features (continued on page 66)

Vendor	Product	Intermediate bit rate support	D4 compatible T-1 network port	Simultaneous AMI, B8ZS (same link/same multiplexer)	Incremental hardware required for fractional T-1	Subrate DDS (DS0-B) support	DS0-level switching in proprietary mode/DACS CCR support	Companding, signaling conversion for T-1 to E-1/A-law and Mu-law conversion	PCM support/mixes PCM channels with multiplexed fractional T-1 bundles	M44 ADPCM on fractional T-1 aggregates	Mix of fractional T-1 aggregates/other aggregate technologies	Direct analog and DDS support for fractional T-1 access	E&M to loop-start or ground-start without external equipment	Existing ISDN interface/same platform ISDN PRI support
Astrocom Corp. St. Paul, Minn. (612) 227-8651	NX2 2-Port Fractional T-1 Multiplexer	Yes	Yes	Yes/yes	No	No	No/yes	No/no	No/no	No	NA	No	No	No/yes
	NX6456 4-Port Fractional T-1 Multiplexer	Yes	Yes	Yes/yes	No	No	No/yes	No/no	No/no	No	NA	No	No	No/yes
	NX1 T-1/Fractional T-1 DSU/CSU	Yes	Yes	Yes/yes	No	No	No/yes	NA/no	No/NA	No	NA	No	NA	No/yes
AT&T Paradyne Largo, Fla. (800) 482-3333	AccuLink 740/741/745	Yes	Yes	Yes/yes	No	Yes	Yes/yes	No/no	Yes/yes	No	Yes	Analog, DDS	No	No/yes
Canoga-Perkins Chatsworth, Calif. (818) 718-6300	3140 Voice/Data Multiplexer	Yes	No	No/no	Yes	Yes	Yes/no	No/no	Yes/yes	No	No	DDS	Yes	No/yes
CASE/Datatel, Inc. Cherry Hill, N.J. (800) 424-4451	DCP9900	Yes	Yes	No/yes	Yes, external CSU required	Yes	Yes/yes	Yes/yes	Yes/yes	No, use transition signaling	Yes	Analog, DDS	Yes	No, designed to support/yes
	DCP9100	Yes	Yes	No/yes	Yes, external CSU required	Yes	Yes/yes	No/no	Yes/yes	No, use transition signaling	Yes	Analog, DDS	Yes	No, designed to support/yes
	DCP9401	Yes	Yes	No/yes	Optional internal T-1 CSU	Yes	Yes/yes	No/no	Yes/yes	No, use transition signaling	Yes	Analog, DDS	Yes	No, designed to support/yes
	DCP3555	Yes	Yes	No/yes	No	No	NA/yes	No/no	Transparent/yes	No	Yes	No	No	No, designed to support/yes
Coastcom, Inc. Concord, Calif. (415) 825-7500	D/I MUX III Intelligent Channel Bank	Yes	Yes	No/no	No	No	Yes/yes	T-1 only/no	Yes, 64K/yes	No	Yes	Analog, DDS	Yes	No/yes
Codex Corp. Mansfield, Mass. (800) 426-1212	6232	Yes	Yes	No/no	Yes, external CSU required	Yes	Yes/no	No/no	Yes/NA	No	NA	Analog, DDS	Yes	Yes, can pass primary link information transparently; no D-channel interpretation/no
Dataproducts New England, Inc. Wallingford, Conn. (203) 265-7151	DPMUX-FT1	Yes	Yes	No/no	No	Yes	No/no	No/no	Yes/no	Yes	Yes, via data ports	Analog, DDS	No	No, ISDN interface requires software changes/yes
Digital Link, Inc. Sunnyvale, Calif. (408) 745-8200	DL55/VX-FT	Yes	Yes	Yes/yes	No	Yes	Yes/no	No/no	Yes/yes	Yes	No	No	No	Passive to ISDN/yes
	DL 100 Digital Service Multiplexer	Yes	Yes	Yes/yes	No	Yes	Yes/no	No/no	Yes/yes	Yes	No	No	No	Passive to ISDN/yes
General DataComm, Inc. Middlebury, Conn. (203) 574-1118	MEGAMUX TMS	Yes	Yes	Yes/yes	No	Yes	Yes/yes	Yes/yes	Yes/yes, including net management	No	Yes	Analog, DDS	No	Yes, data and voice meet AT&T, CCITT and Nippon Telephone and Telegraph standard for PRI/yes
Hubbell, Inc. Pulsecom Division Herndon, Va. (703) 471-2950	T-1 Business-Bank	Yes	Yes, and ANSI T1.403-1989 ESF data links	No/yes	No	Yes	Yes/yes	T-1 only/no	Yes/yes	Yes	Yes	Analog, DDS	Yes	Yes, AT&T NT1 interface, T interface, U interface/sup-ports Basic Rate NT1, U and T interfaces
Infotron Systems Corp. Cherry Hill, N.J. (800) 926-9600	NX4600, NX3200, NX3000	Yes	Yes	No/yes	Can be implemented either way	Yes, with a proprietary format	Yes/yes	Yes/yes	Yes/yes	Supports CCITT ADPCM algorithms (old, new)	Yes	Analog, DDS	No	Yes/yes
Intraplex, Inc. Littleton, Mass. (508) 486-3722	Variable Rate Multiplexer	Yes	Yes	Yes/yes	Yes	No	Yes/yes	No/no	Yes/no	Yes	Yes	Analog, DDS	Yes	No/no
Larse Corp. Santa Clara, Calif. (408) 988-6600	Split-T	Yes	Yes	No/yes	No	No	NA/no	T-1 only/no	Yes/NA	No	No	No	No	No, but is transparent to any PRI signal that is passed through/yes

ADPCM = adaptive differential pulse code modulation
AMI = alternate mark inversion
B8ZS = bipolar eight zero code substitution
CCITT = Consultative Committee on International Telephony and Telegraphy
CCR = customer-controlled reconfiguration
DACS = Digital Access and Cross-Connect System

DDS = digital data service
DSU = data service unit
ESF = extended superframe format
NA = not applicable
PCM = pulse code modulation
PRI = Primary Rate Interface

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SOURCE: TELECHOICE, INC., MANCHESTER, CONN.

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Fractional T-1 equipment features (continued on page 69)

Vendor	Product	Intermediate bit rate support	D4 compatible T-1 network port	Simultaneous AMI, B8ZS (same link/same multiplexer)	Incremental hardware required for fractional T-1	Subrate DDS (DS0-B) support	DS0-level switching in proprietary mode/DACS CCR support	Companding, signaling conversion for T-1 to E-1/A-law and Mu-law conversion	PCM support/mixes PCM channels with multiplexed fractional T-1 bundles	M44 ADPCM on fractional T-1 aggregates	Mix of fractional T-1 aggregates/other aggregate technologies	Direct analog and DDS support for fractional T-1 access	E&M to loop-start or ground-start without external equipment	Existing ISDN interface/same platform ISDN PRI support
Micom Communications Corp. Simi Valley, Calif. (800) 642-6687	Marathon 5K	Yes	No	No/no	No	Yes	Yes/limited	Yes/yes	Yes, also supports new low bit rate voice 4.8K to 16K bit/sec/yes, uses Micom's fast packet proprietary Low Delay Protocol	NA	Yes	Analog, DDS	Yes	No, designed to support/yes
Network Equipment Technologies, Inc. Redwood City, Calif. (415) 366-4400	IDNX/10	Yes	Yes	No/yes	No	Yes	Yes/no	Yes/yes	Yes/yes	Yes	Yes	Yes, can support direct DDS without an embedded signaling channel via a port-side connection	No	Yes, tested with Meridian SL-1 and SL-100 PBXs in clear-channel mode/yes
	FT1 Access DSU/CSU	Yes	Yes	No/yes	Yes, D4 T-1 port card required	No	Yes/no	Yes/provided by IDNX	Yes/yes	No	Yes	Analog, DDS	Provided by IDNX	NA/yes
	IDNS/20, IDNX/40, IDNX/70	Yes	Yes	No/yes	Yes, D4 T-1 port card required	No, future	Yes/no	Yes/yes	Yes/yes	Yes	Yes	Analog, DDS	Yes	Yes, tested with Meridian SL-1 and SL-100 PBXs in clear-channel mode/yes
Newbridge Networks, Inc. Herndon, Va. (703) 834-3600	Mainstreet 3600	Yes	Yes	No/yes	No	Yes	Yes/yes	Yes/yes	Yes/yes	Yes	Yes	Analog, DDS	Yes	Yes, currently supports ISDN 2B+D format for U interface/yes
Phoenix Microsystems, Inc. Huntsville, Ala. (800) 866-8480	1564 FT-1 Gateway, Data-T	Yes	Yes, D4 compatible can also be carried in the ESF Facility Data Link	No/yes	No	Yes, when attached to the 1565 subrate data multiplexer	Yes, nonproprietary mode of operation/yes	No/no	Yes, but only at digital level/yes, as long as the PCM signal is DACS compatible	Yes, at a digital level (bypass mode only)	Yes (bypass mode only)	DDS	No	Yes/yes (in bypass mode)
Racal-Milgo Sunrise, Fla. (800) 722-2555	Omnimux 9000	No	Yes	No/yes	Yes, CSU only	No	No, first quarter 1991/yes	No/no	Yes/yes	Yes	Yes	Analog, DDS, via DSU	No	Yes, can route DS0 channels and pass D-channel information but not interpret/yes
	Omnimux 8000	Yes	Yes	Yes/yes	No	Yes, with external equipment	Yes/no	No/no	Yes/yes	Yes	Yes	Analog, DDS	No, must use external equipment	No/yes
	Omnimux 7000I	Yes	Net port is M24 compatible but does not carry the network control and management channel	No/no	Yes	No, expected November 1990	Proprietary modes not used/yes	No/no	Yes/no	No	No	Analog, DDS	Yes	No/no
RAD Data Communications, Inc. Rochelle Park, N.J. (201) 587-8822	FCD-1	Yes	Yes	No/no	No	No	Yes/yes	No/no	NA/NA	No	Yes	Analog	No	No/no
Republic Telcom Systems Corp. Boulder, Colo. (800) 822-6227	RNET Networking System	Yes	No	No/no	Yes	No	Yes/no	No/no	No/yes	No	Yes	Analog	No	No, requires external interface equipment/no
Scitec Communications Systems, Ltd. Middletown, R.I. (401) 848-4353	Integrator 1500	No	Yes	No/yes	Yes, external CSU	No	Yes/no	NA/No	No/yes	No	No	No	No	No/no
	IDM-FT1	Yes	No	No/yes	Yes	No	Yes/no	No/no	No/yes	No	Yes	DDS	No	No/yes
StrataCom, Inc. Campbell, Calif. (408) 370-2333	FastPacket IPX	Yes	Yes	No/yes	Yes	No	NA/Supports Digital Signal Cross-connect-1	Yes, signaling conversion only in U.K./yes	Yes/yes	No	Yes	DDS	Yes	Yes/yes
Telco Systems Network Access Corp. Fremont, Calif. (415) 490-3111	Route-FT1	Yes	Yes	Yes/yes	No	Yes	Yes/yes	No/no	Yes/yes	Yes	Yes	Analog, DDS	Yes	No/no
Telecommunications Technologies, Inc. Milpitas, Calif. (408) 945-7904	INPATH	Yes	Yes	Yes/yes	No	Yes	Yes/yes	No/no	Yes/yes	No	Yes	Analog, DDS	Yes	Yes/yes

ADPCM = adaptive differential pulse code modulation
AMI = alternate mark inversion
B8ZS = bipolar eight zero code substitution
CCR = customer-controlled reconfiguration
DACS = Digital Access and Cross-Connect System
DDS = digital data service

DSU = data service unit
ESF = extended superframe format
IDNX = Integrated Digital Network Exchange
NA = not applicable
PCM = pulse code modulation
PRI = Primary Rate Interface

This chart includes a representative selection of vendors in the fractional T-1 multiplexer market. Most vendors offer other fractional T-1 multiplexers, and many vendors not included offer a full range of competitive products.

SOURCE: TELECHOICE, INC., MANCHESTER, CONN.

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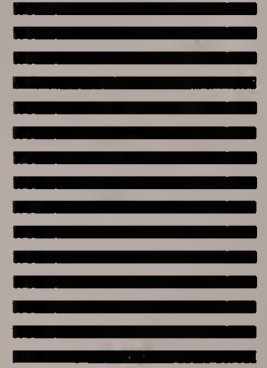
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The outlook for fractional T-1

By Nathan Muller
Special to Network World

The interexchange carriers' fractional T-1 services typically require full T-1 access from local exchange carriers because the local exchange carriers don't offer fractional T-1 access facilities. Therefore, users will be motivated to either fill the unused portion of the T-1 access line's bandwidth or consider migrating the entire net to full T-1.

However, an AT&T user today can fill the T-1 pipe from customer premises equipment to AT&T's point of presence with DS0-based services such as AT&T's Megacom and Software-Defined Network. AT&T offers this under its Static Integrated Network Access arrangement.

To justify the cost of the T-1 line, a net manager needing only 384K bit/sec for a data application can fill the unused portion of the T-1 line with 18 channels of voice traffic. At the AT&T Digital Access and Cross-Connect System, the dedicated 384K bit/sec channel and 18 switched channels are split from the incoming DS1. The 384K bit/sec DS0 bundle is then routed.

But an interesting thing can happen with the 18 DS0s carrying voice: At a nominal cost to the user, AT&T will route the 18 voice channels back to the local exchange carrier for distribution. In effect, the user gets 18 channels at far less cost than 18 separate lines for voice — depriving the local exchange carrier of usage-based revenues.

How devastating can this form of bypass become? Consider this: Without offering their customers 384K bit/sec fractional T-1 service and billing for it accordingly, the local exchange carriers are giving up much more in the form of usage-based revenues, continuing the trend toward increasing use of virtual private networks.

Add voice compression via adaptive differential pulse code modulation into this equation and the lost dollars to local exchange carriers doubles. If enough users engage in such bypass, the local exchange carriers may become nothing more than wire and cable companies.

The local exchange carriers can counter this threat by offering local fractional T-1 access. This would enable them to bill users for only the bandwidth ordered and eliminate the incentive to consolidate usage-based traffic on the leased facility.

Viewing the T-1 access line as a pipe and including virtual network drastically alters the cost for the user; in a few short years, Synchronous Optical Network (SONET) will alter these costs even more. Whereas the cost of T-1 service has been driven as low as it is likely to get, SONET permits the cost of fractional T-1 to be driven much lower. ■

Muller is manager of consultant relations at General DataComm, Inc. in Middlebury, Conn.

(continued from page 55)
vice (DDS) customers that are migrating to the fractional services.

The carriers differ substantially in the way they define their services.

■ AT&T has defined fractional T-1 services under Accunet Spectrum of Digital Services (ASDS) as a single 56K bit/sec channel, as well as in 64K bit/sec increments of one, two, four, six, eight and 12 channels. This means that AT&T customers can get speeds of 56K, 64K, 128K, 256K, 384K, 512K and 768K bit/sec. The customer can also get more than one 56K bit/sec channel under ASDS, but this is in noncontiguous bandwidth. The carrier has also added 9.6K bit/sec service to ASDS, bringing the service to the low-speed end of the market.

■ MCI Communications Corp. is currently

moving toward this same definition with its offering called Digital Private Line Service (DPLS). DPLS currently offers speeds of 56K and 64K bit/sec; contiguous transmission in 56K and 64K bit/sec increments of at least two, four, six, eight and 12 channels will be released in the first quarter of 1991.

MCI may offer more flexibility than AT&T by releasing additional increments as well.

■ US Sprint Communications Co. sells fractional functionality through two separate offerings. Users of US Sprint's Clearline Fractional 1.5 service can get from two to 12 contiguous 56K bit/sec channels.

Single-channel 56K bit/sec service is marketed as DDS Clearline Voiceband;

64K bit/sec increments for this product are scheduled for release in the fourth quarter.

■ Cable and Wireless Communications, Inc.'s Intelli-Flex product is the only product of the largest carriers to offer full fractional T-1 support with speeds of 56K bit/sec and 64K bit/sec, in increments from one to 24 channels.

For completeness, this article assumes that fractional T-1 is defined as increments of 56K and 64K bit/sec, up to a full T-1. If not yet available, the on-demand capabilities of Integrated Services Digital Network technology will force such incremental definitions of fractional T-1 in the future.

To date, the regional Bell holding companies offer only limited fractional T-1 access. (continued on page 69)

To join local area networks together, LAN administrators have traditionally relied on bridges, routers, repeaters, gateways, and enough wires to give birth to a small electric company.

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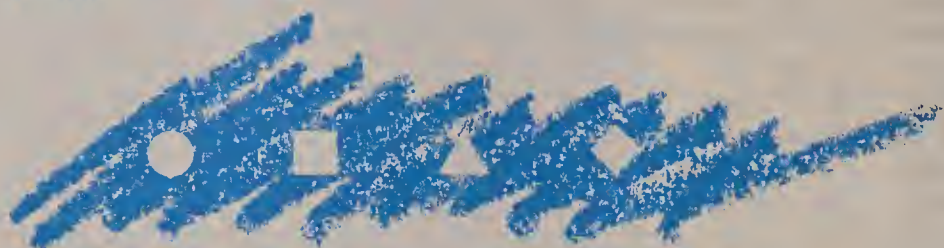
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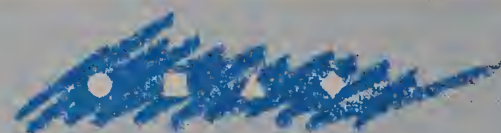
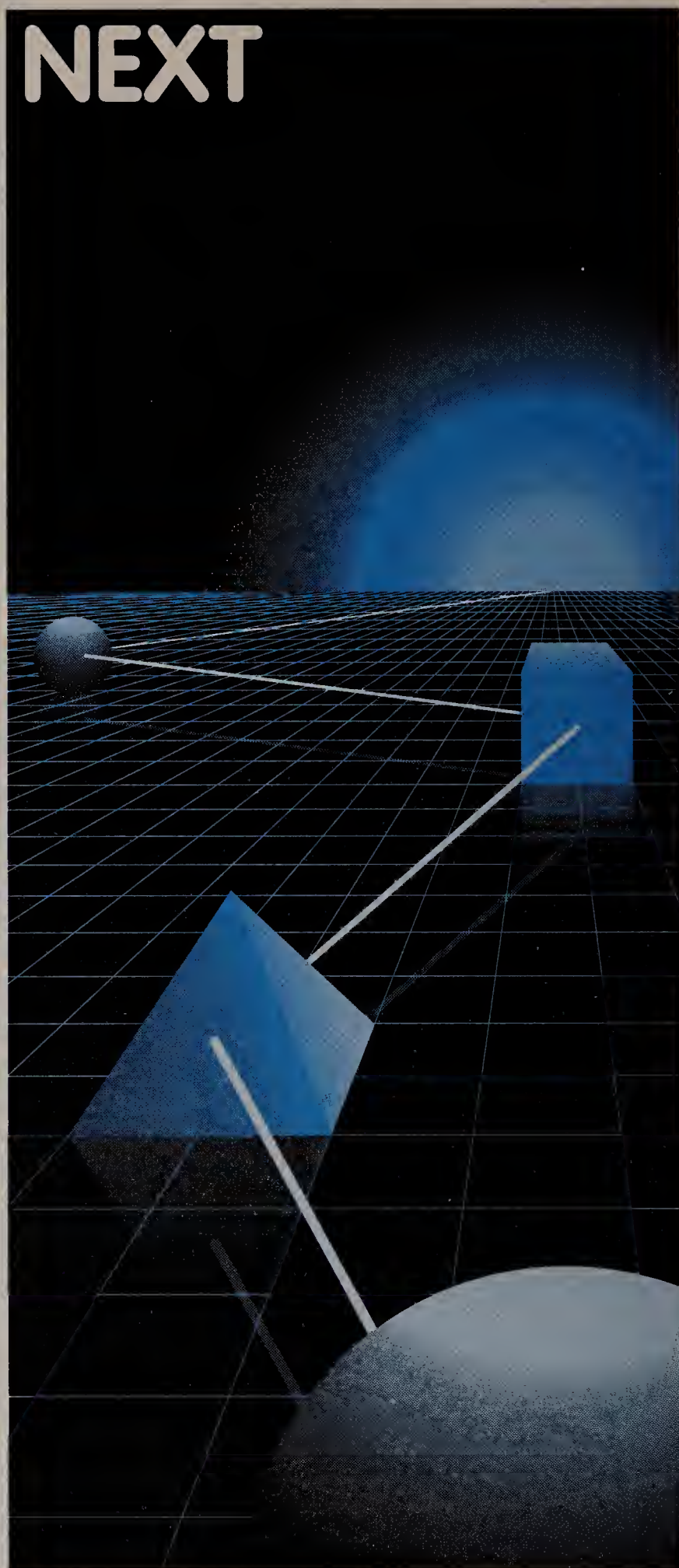
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Fractional T-1 equipment features (continued from page 66)

Vendor	Product	Intermediate bit rate support	D4 compatible T-1 network port	Simultaneous AMI, B8ZS (same link/same multiplexer)	Incremental hardware required for fractional T-1	Subrate DDS (DS0-B) support	DS0-level switching in proprietary mode/DA-CS CCR support	Companding, signaling conversion for T-1 to E-1/A-law and Mu-law conversion	PCM support/mixes PCM channels with multiplexed fractional T-1 bundles	M44 ADPCM on fractional T-1 aggregates	Mix of fractional T-1 aggregates/other aggregate technologies	Direct analog and DDS support for fractional T-1 access	E&M to loop-start or ground-start without external equipment	Existing ISDN interface/same platform ISDN PRI support
Telematics International, Inc. Fort Lauderdale, Fla. (305) 772-3070	Digital Wideband Exchange	Yes	Yes	Yes/yes	No	No	Yes/no	Yes/yes	Yes/yes	No	Yes	Yes, analog voice support for two- and four-wire E&M types 1, 2, 3 and 5; yes, via V.35 or RS-449	Yes, E&M types 1, 2, 3 and 5	Yes, at the PRI transparent to D-channel signaling/yes, interface level transparent to signaling
Teleprocessing Products, Inc. Simi Valley, Calif. (805) 522-8147	TP-9000 FT-1 MUX	Yes	Yes, D4 and ESF	No/no	No	No	Yes/no	No/no	Yes/yes	No	Yes	No	No	No/yes
Tellabs, Inc. Lisle, Ill. (708) 969-8800	Crossnet	Yes	Yes	Yes/yes	No	Yes	Yes/yes	Optional, requires Tellabs' ancillary products/ optional, requires Tellabs' ancillary products	Yes/yes	Optional, requires Tellabs' ancillary products	Yes	Analog, DDS	Yes	Yes, at the PRI transparent to D-channel signaling/yes
Teltrend, Inc. St. Charles, Ill. (800) 835-8736	M-826 MAXI	Yes	Yes	No/no	No	Yes	Yes/no	No/yes	Yes/yes	No	Yes	Analog, DDS	No	No/yes
Timeplex, Inc. Woodcliff Lake, N.J. (201) 391-1111	micro-LINK/2+	Yes	Yes	No/yes	Yes, T-1 CSU	Yes	Yes/yes	Yes/yes	Yes/yes	No	Yes	Analog, DDS	No	At this time, the LINK systems can terminate Layer 1 to Layer 2 ISDN PRI services/yes
	mini-LINK/2+	Yes	Yes	No/yes	Yes, T-1 CSU	Yes	Yes/yes	Yes/yes	Yes/yes	No	Yes	Analog, DDS	No	At this time, the LINK systems can terminate Layer 1 to Layer 2 ISDN PRI services/no
	LINK/2+	Yes	Yes	No/yes	Yes, T-1 CSU	Yes	Yes/yes	Yes/yes	Yes/yes	No	Yes	Analog, DDS	No	At this time, the LINK systems can terminate Layer 1 to Layer 2 ISDN PRI services/no
Verilink Corp. San Jose, Calif. (408) 945-1199	Connect FT1	Yes	Yes	No/no	No	No	NA/DACS compatible	No/NA	No/NA	NA	Yes	No	NA	NA/NA

ADPCM = adaptive differential pulse code modulation
 AMI = alternate mark inversion
 B8ZS = bipolar eight zero code substitution
 CCR = customer-controlled reconfiguration
 DACS = Digital Access and Cross-Connect System

DDS = digital data service
 ESF = extended superframe format
 NA = not applicable
 PCM = pulse code modulation
 PRI = Primary Rate Interface

This chart includes a representative selection of vendors in the fractional T-1 multiplexer market. Most vendors offer other fractional T-1 multiplexers, and many vendors not included offer a full range of competitive products.

SOURCE: TELECHOICE, INC., MANCHESTER, CONN.

(continued from page 67)

cess. In most instances, customers must use a full T-1 line from the local exchange carrier to link the user site with the long-distance carrier's fractional T-1 service (see "The outlook for fractional T-1," page 67).

Divvying up the market

There are many ways to slice up the requirements for fractional T-1 multiplexing. One way is to divide the market into those users with an existing network and those without.

Another way is to look at those users with sophisticated network management needs vs. those without.

Depending on what a user is

seeking, a select group of fractional T-1 products exists to fulfill those needs.

Certainly, one can make a broad distinction between networking devices and stand-alone, point-to-point devices. The former generally address the higher end of the fractional T-1 market, while the latter address the lower end.

Furthermore, network management requirements tend to be more intense in the high-end networking environment than in a simple point-to-point application.

Keeping all of this in mind, today's fractional T-1 equipment vendors are concentrating on two major segments of the market-

place. One segment consists of "upward-compatible" buyers that:

- Are trying to cram multiple applications over limited facilities — particularly DDS and analog voice-grade channels;
- Need more digital bandwidth than provided through DDS or switched 56K bit/sec services;
- Are migrating to larger or more efficient bandwidth products;
- Don't want or can't afford a full T-1 circuit;
- Need to purchase equipment that will enable them to extend their current capabilities to the fractional T-1 level while still maintaining compatibility with their current capabilities; or
- Aren't accustomed to private

networking.

For these upward-compatible users, vendors must spend a great deal of time educating the buyers about private networks. Low-end equipment is often marketed in beginner's packages for the first-time user.

In most instances, this end of the market requires a one- or two-port device with limited multiplexing capabilities. Typically, this is provided through a combined T-1 DSU/CSU, sometimes with a small built-in time-division multiplexer, at a cost of about \$1,500 to \$3,000.

Some DSU/CSU products permit drop-and-insert functions from other fractional T-1 channels.

A second major segment of the market is "downward-compatible," consisting of users that have:

- T-1, or even T-3, networks in place;
- A desire to provide greater network reliability through mesh networking;
- The need for broader network coverage that allows them to bring outlying corporate sites onto the company network through drop-and-insert techniques; or
- Existing network management systems and, therefore, network management concerns.

These downward-compatible users are generally served with (continued on page 70)



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(continued from page 69)

T-1 multiplexers adapted for fractional T-1 capabilities or fractional T-1 multiplexers.

Network management is a crucial issue, especially for this second set of users. Mid-size and large end-user organizations are searching for a fractional multiplexer or similar capability as a piece of the overall network equipment structure, not as a stand-alone piece of equipment. In this case, the purchase decision can go two ways: users can either buy equipment that is directly compatible with the existing network equipment structure or prepare to manage a heterogeneous network. Either option limits the selection of equipment to that which is either manufactured or approved by the existing vendor. A user that buys unapproved products must deal with

finger-pointing when problems occur.

In many cases, devices not directly supported by a vendor's network management platform may be supported through special interfaces, but the pricing of these custom connections can be a prohibitive factor.

The best path for users and vendors is an integrated system. It will be difficult for small vendors of CSUs, DSUs and channel banks to compete against integrated fractional T-1, T-1 or T-3 network offerings. These vendors will have to find another vendor that is willing to include the CSU or DSU as part of their equipment in an OEM-type arrangement.

Users at the lower end of the market generally do not require sophisticated multinode management capabilities be-

cause they generally are point-to-point or other smaller style applications. Simple loop-back testing and diagnostic capabilities, available with most CSUs and DSUs, suffice. When these users try to expand beyond simple point-to-point applications, they run into the same net management issues mentioned above for applications.

It's questionable whether fractional T-1 multiplexers exist outside of marketing lingo. Most vendors have a difficult time distinguishing between a fractional T-1 multiplexer and a standard one.

Since fractional T-1 multiplexers must be linked to a local exchange carrier's T-1 access line, they must function as standard T-1 multiplexers. Standard T-1 multiplexers are used to deal with fractions of a T-1 circuit, as is required of fractional T-1 de-

vices. The only difference between the two is that fractional multiplexers must have D4 formatting capabilities, which are optional on many standard T-1 multiplexers.

Even now, however, D4 formatting capabilities are becoming a standard feature of many T-1 multiplexers, making this difference largely moot. Except for price, there are few discrete differences between the two types of devices.

Fractional T-1 multiplexers are merely downsized standard T-1 multiplexers, renamed to take advantage of the market niche. If a user company wants to take inbound information and drop it into limited DS0 bundles for transmission over a point-to-point T-1 link, then a DSU/CSU will likely suffice.

For multisite firms, selecting a multiplexer becomes an analysis of current and future requirements, which is standard operating procedure for anyone buying equipment. As the size of each fractional site gets smaller, the DSU/CSU option be-

(continued on page 85)

A look at the equipment

There are several ways in which fractional T-1 multiplexing may be accomplished. Users looking for this capability will have to examine a number of equipment technologies such as:

■ **Channel bank.** This is a form of multiplexer that puts many signals onto a high-speed channel. The major differences between a channel bank and a standard multiplexer is the channel bank is typically found behind a private branch exchange and is a static channel-division device, meaning you cannot change the bandwidth dynamically.

■ **Channel service unit (CSU).** CSUs perform several functions in provisioning a T-1 signal, such as signal enhancement and loop-back testing. While they don't perform the synchronization function of the circuit, they keep track of the circuit's polarization/bipolarization. In this configuration, a CSU acts similar to a repeater — a device that conditions, sharpens and enhances the signal while providing testing and signal monitoring capabilities.

■ **Data service unit (DSU).** DSUs format the information by taking in the raw digital information and molding it into a D4-compatible signal. Most of these functions are now performed by the CSU, as discussed above. In fact, most CSU and DSU devices are marketed today as combined units.

■ **T-1 multiplexer.** A T-1 multiplexer combines or divides carrier channels or frequencies, either dynamically or in a fixed or static mode. T-1 multiplexers are designed to, at minimum, take DS0 input and format the signals into a single T-1 1.544M bit/sec output stream.

■ **Fractional T-1 multiplexer.** There are few differences between a T-1 multiplexer and a fractional T-1 multiplexer. A fractional T-1 multiplexer must be able to provide a D4 framing format for the T-1 output. Most multiplexers today offer this functionality, making the term "fractional T-1 multiplexer" more of a marketing term than an actual technical grouping.

— Daniel Briere



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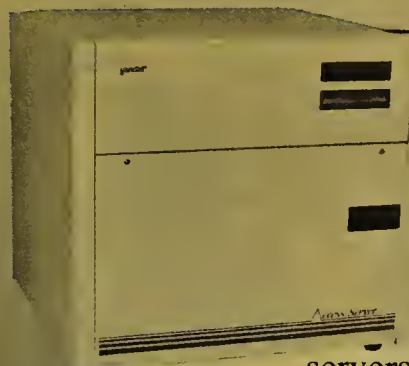
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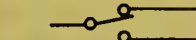
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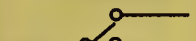
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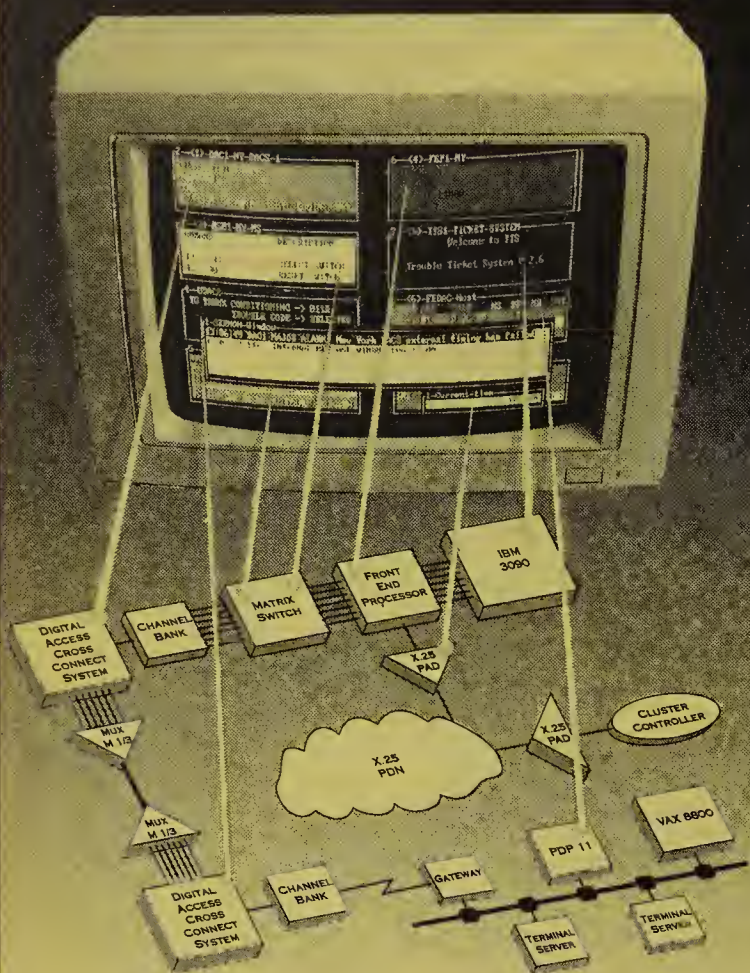
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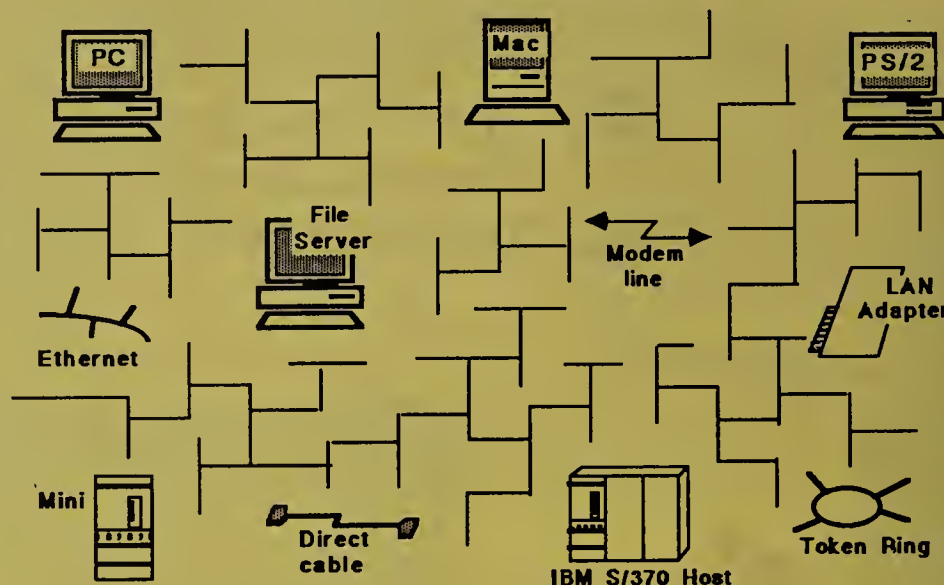
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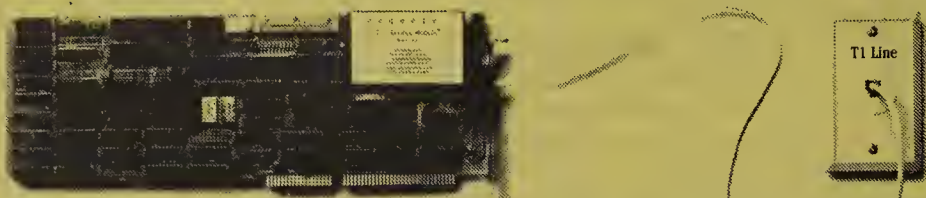
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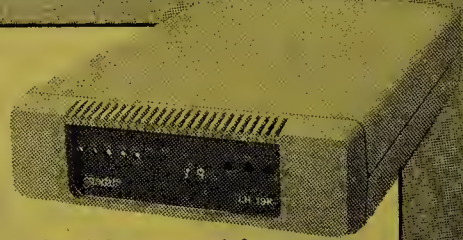
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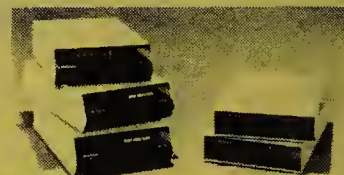
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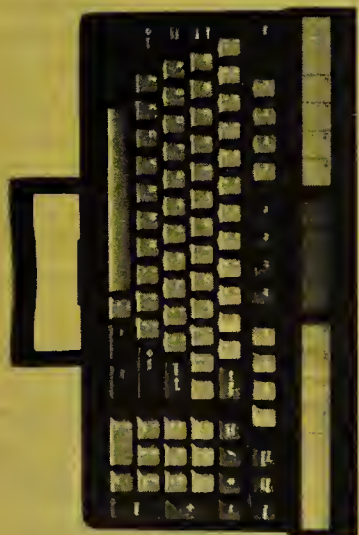
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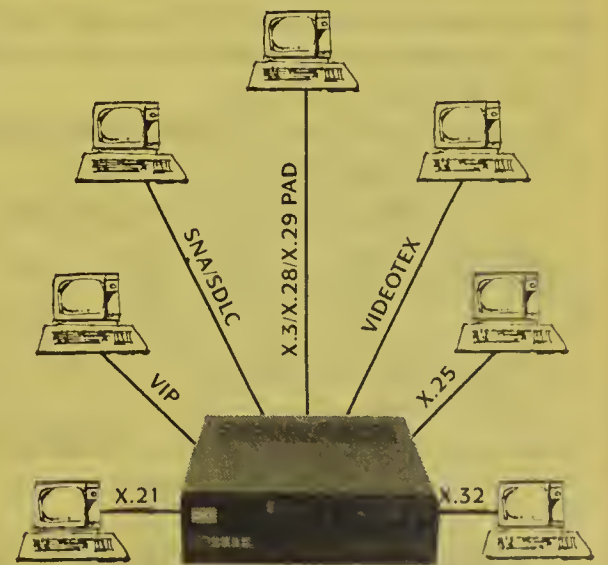
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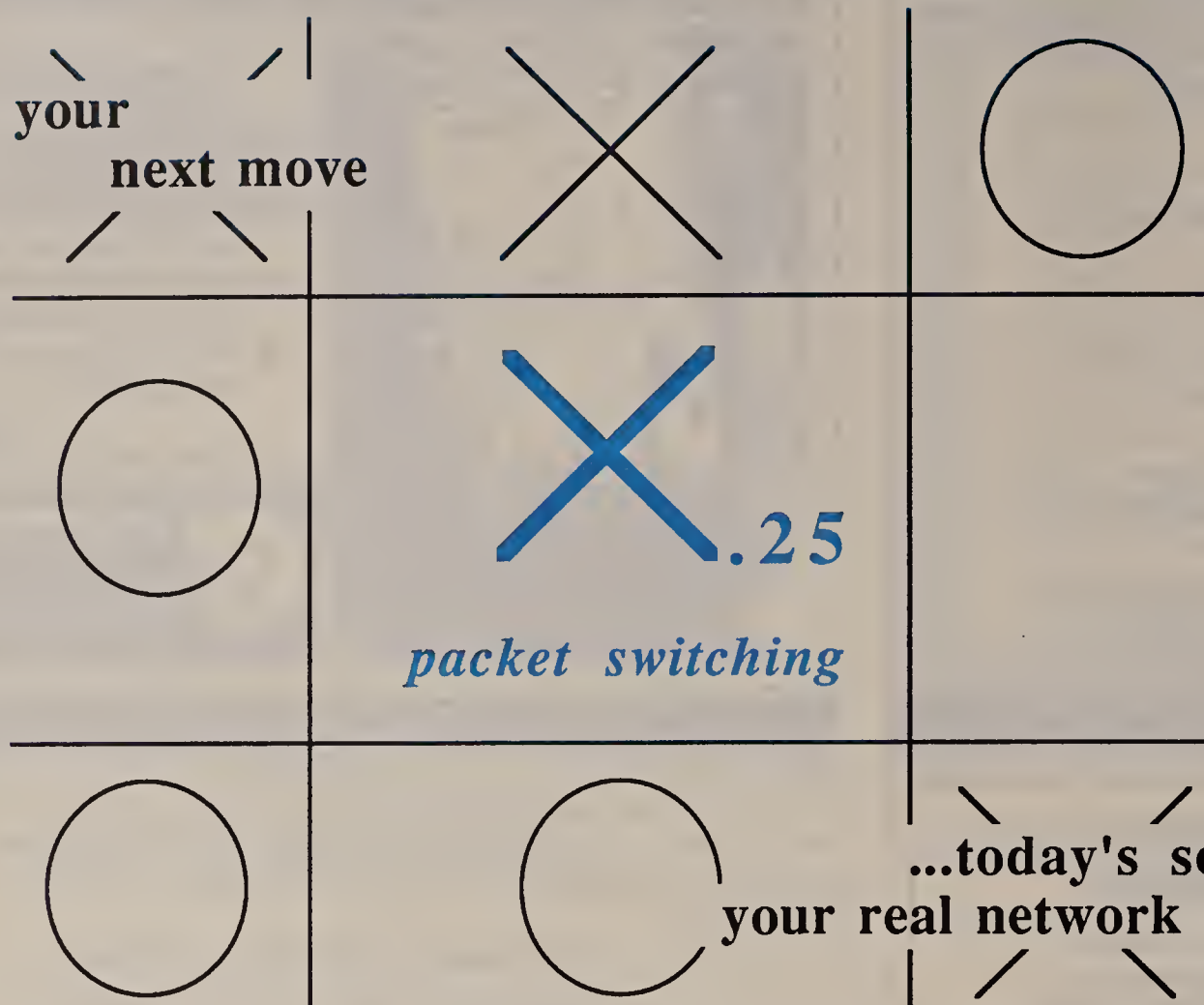
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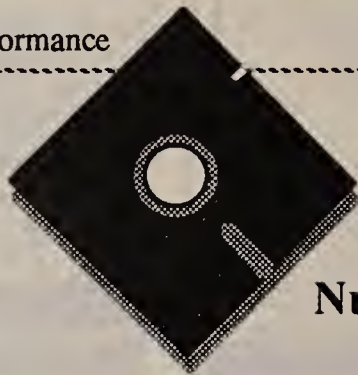
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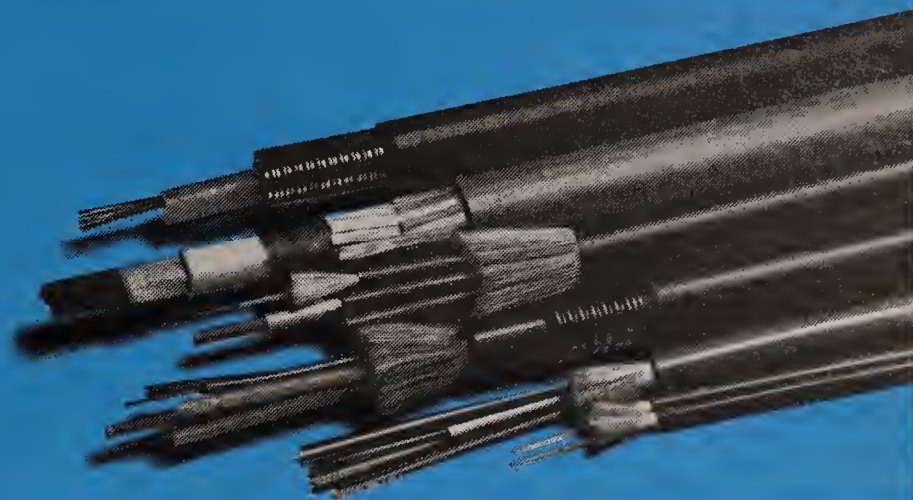
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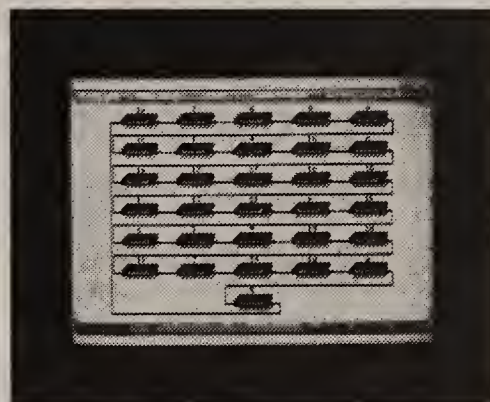
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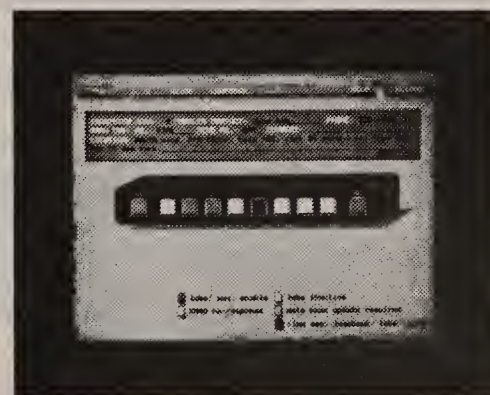
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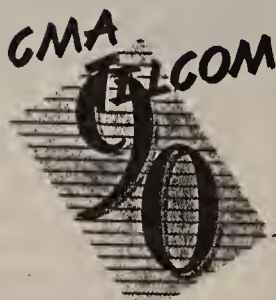
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B8ZS vs. AMI formatting

An important issue for fractional T-1 users involves contiguous vs. noncontiguous DS0 transmission. Users searching for multiplexer functionality need to check whether it matters if a 256K bit/sec signal is transmitting within a single 256K bit/sec stream or within alternate DS0 channels. For most users, this is a question of what long-distance offerings are available.

The three major long-haul carriers differ in the way they offer fractional T-1 services. Fractional service formats are in a transitory state that reflects the underlying networks on which they are based. Under AT&T's alternate mark inversion (AMI) formatting, users were required to drop user data information into alternating DS0 channels. That is, data would be placed in Slot 1, 3, 5, 7 and so forth, according to the number of DS0s ordered from the carrier.

Intermediate channels were filled with a ones pattern to guarantee the proper ones density to maintain syn-

Fractional service formats are in a transitory state.

▲▲▲

chronization of the overall circuit. Fractional T-1 multiplexers have been used to police this traffic.

However, changes to the AT&T network have allowed for contiguous bandwidth over the fractional T-1 circuit. Using bipolar eight zero code substitution (B8ZS) protocols, clear-channel 64K bit/sec transmission is possible, thereby eliminating the need for the intermediate ones-density patterns. It also allows for more enhanced line diagnostics on an ongoing basis.

MCI Communications Corp. and US Sprint Communications Co. both use B8ZS in their fractional T-1 offerings. AT&T's network is currently mixed as it is in the process of installing B8ZS-compatible equipment. In time, all AT&T equipment will have clear-channel capacity. By late 1992, more than 80% of AT&T's major domestic traffic routes will be clear channel.

AT&T's mixed network can present the user with problems when trying to coordinate multiple I/Os with the same fractional T-1 multiplexer. A user may have diversely routed fractional T-1 links, requiring both AMI and B8ZS support with the same device. Also, a customer might want to take an AMI and a B8ZS fractional link and multiplex them over a single T-1 link, maintaining the integrity of the fractional T-1 bundle. The chart beginning on page 64 lists the capabilities of each product with respect to simultaneous AMI/B8ZS transmission.

— Dantel Briere

(continued from page 70)

comes more viable. However, as the growth potential increases, the money might be better spent on a device with full T-1 multiplexing capabilities and lots of output port expansion space.

When evaluating fractional T-1 equipment, users will find discrete differences among the products. The chart beginning on page 56 lists the features and capabilities of a number of CSUs, DSUs, fractional T-1 multiplexers and T-1 multiplexers on the market today.

Choosing among the various devices is not an easy task. Some of the more critical items to ask about are:

■ **Embedded supervisory information.** If users route two 56K bit/sec channels over the same interface, older multi-

plexers acknowledge them as one trunk. An embedded supervisory channel allows the user to route these two trunks over one interface and still treat them as distinct channels for testing and alternate routing purposes. Without such a channel, the user is left with inexpensive dumb feeder devices with no control over the routing of individual channels.

A case in point are fractional CSUs, which do not embed control-channel information into the link. Most CSUs can only acknowledge the fact that the information is going to another CSU; they have limited ability for device control over multiple CSUs at various locations. The fact that CSUs do not embed control channel information into the link is a crucial difference between the DSU/CSU type of prod-

ucts and multiplexers with fractional capabilities.

Embedded supervisory channels are critical to using fractional T-1 services for networking support. T-1 multiplexers pass management and control information over these internodal links. Managers looking to place multiple fractional T-1 bundles on the same local channel for connection to different long-haul circuits must have a device capable of handling multiple supervisory channels. Each bundle must have its own embedded supervisory channel.

■ **Voice compression with inband signaling.** Inband signaling is often the preferred user technique for voice compression on fractional T-1 circuits. Out-of-

(continued on page 87)



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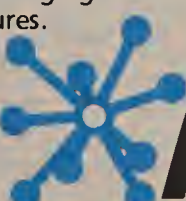
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AT&T

The right choice.

(continued from page 85)

band signaling requires a portion of another DS0, which limits user flexibility and economy. Take a typical 44-channel, voice-compressed T-1 circuit using adaptive differential pulse code modulation (ADPCM). A user can get 11 voice channels in six DS0s. However, the last half of the sixth DS0 is used for signaling for the six DS0s. This means that all six DS0s must be routed together through the network.

For a user that may want to route DS0s to different locations, the signaling for each channel would have to be integrated into the DS0 channel. For voice compression, it is important to have ADPCM support in the device and the ability to embed the supervisory channel within the DS0.

Because of limitations such as these, users are no longer utilizing M44 voice compression, a multiplexing format that allows users to derive 44 ADPCM channels from a single T-1. A user that wants to do compression in a standard environment can use G.721, an international compression algorithm standard, and G.761, an international multiplexing scheme for compression into the 64K bit/sec frame.

■ Compression technology. Especially in the low end of the market, where bandwidth becomes more valuable to the end user since there is much less of it to waste, compression technology becomes a major issue in the evaluation of fractional T-1 equipment. A user with only 128K bit/sec on a fractional link must be frugal about bandwidth distribution, especially with international applications in which an extra 64K bit/sec can cost thousands of dollars.

Many units combine data compression, speech compression, facsimile demodulation and the ability to bridge data, whether it is synchronous, asynchronous or local-area network data streams, using multiple technologies to squeeze as much information as possible over 64K or 128K bit/sec. Speech compression shrinks a 64K bit/sec signal into 8K bit/sec; fax demodulation takes an inbound Group III or Group IV fax signal, strips out unnecessary overhead and routes only the message data to the destination.

Users need to evaluate how efficient they want their system to be. While the user can send more information over highly compressed lines, the cost of this greater efficiency is equipment limitation. Proprietary schemes limit the choice in selecting another vendor's device. More flexible devices use standard subrate data multiplexer (DS0-B) compression techniques, and a user can buy a DS0-B device from different vendors and have them operate in the same net without worrying about incompatible formats. However, proprietary schemes allow for greater line utilization.

■ External hardware. Low-priced devices are great if that's all a user has to buy, but look out for external equipment required to complete the system. Often, multiplexers require a supplemental CSU and DSU to support the fractional T-1 channel. This means more expense.

■ Rate adaptation to various standards. Users want to take advantage of DS0s in as efficient a manner as possible. In some cases, proprietary schemes may be used. Hybrid networking — using both public and proprietary schemes on the same circuit — is not unusual.

To be flexible, equipment needs to adapt on a DS0 level to these different schemes. Two indications of this capability are whether the device supports subrate DDS (DS0-B) and whether the T-1 can be switched on a DS0-by-DS0 basis when operating in a proprietary mode.

■ Network management. This is another critical issue, especially for network managers. Channel loop-back diagnostics allow users to perform logical echoing or transmit and receive signals for a channel, which helps locate lack of continuity in a circuit. Many management packages for the fractional T-1 market are just standard T-1 diagnostics on a DS0 level — not diagnostics on fractional T-1 bundles.

■ ISDN support. A big issue for all equipment manufacturers is the degree to which hardware will be able to migrate to ISDN on the existing platform. Some require additional hardware, and others will not be able to support ISDN. Most devices provide only basic pass-through support of the ISDN protocol. The chart on page 64 displays current and future ISDN capabilities of fractional T-1 multiplexers, CSUs and DSUs.

■ Switched vs. dedicated: Up until now, fractional T-1 services have been dedicated circuit-based services. However, in May, AT&T announced the capability for dial-up bandwidth under its Software-Defined Data Network offering, which is expected to offer dial-up 1.544M bit/sec capacity at the end of 1991. Users looking to support dial-up fractional T-1 capacity, either as a stand-alone or backup application, should evaluate whether the fractional multiplexer can handle switched connections.

It's debatable where the fractional T-1 market will go from here. While conceptually a great idea, the services may be obsolete almost before they are launched because low T-1 service prices endanger the future viability of fractional T-1 services. The continual decreases in the pricing of T-1 services may prompt users to skip to full T-1 products.

This is particularly true given the lack of complementary fractional T-1 access on the part of the local exchange carriers. With the long-distance carriers rushing to market their fractional T-1

services, local telephone companies are wondering if they want to develop the services at all. In the absence of fractional T-1 access facilities, access must be through full T-1 circuits. The access channels at each end of the long-haul circuit must have full T-1 access, which limits the true economic feasibility of installing fractional T-1 links in a network.

A few fractional T-1 local exchange access offerings are available. For example, Nynex Corp. has a product, but the marginal cost of migrating to full T-1 access is minimal. Under New England Telephone and Telegraph Co.'s current tariffs, a user in downtown Boston pays \$489.24

for a two-mile, 12-channel fractional T-1 access circuit, according to Ann Bookbinder Custodio, product manager of carrier sales at The Aries Group/MPSG in Rockville, Md. A T-1 link of comparable length would cost \$627.56. To gain 12 more channels, a user would have to pay about \$138. True cost differences only start coming into play with longer distance access circuits. A 13-mile, 12-circuit fractional T-1 circuit would cost \$733.44, while a T-1 link would be \$931.07 — a greater difference.

In any case, the splash made by fractional T-1 services will likely prompt many smaller users toward the digital T-1 multiplex-

er market, especially those that want to try private-line circuits. This is largely due to the future expandability of T-1 multiplexer equipment. In addition, because of the price and flexibility of the services, users can substantially increase bandwidth overnight when moving from fractional to full T-1 services.

It's possible that the fractional T-1 multiplexer and service markets will be a transitory phenomenon. CSU and DSU products will remain a one- and two-channel solution, finding growth in the emerging single-channel LAN-to-wide-area net market as well as in the DDS-to-fractional T-1 service migration. □

Category definitions

The following are edited versions of the actual questions, as well as brief explanations of them, posed to the vendors during the research phase of the fractional T-1 Buyer's Guide charts, which begin on pages 56 and 64.

The information in the charts was provided by the vendors; readers should contact the vendors directly with any questions as to product capabilities, features or implementations. Telephone numbers are given for each vendor listed in the charts.

Chart 1 — Categories:

■ Product type: What is the type of product, such as a T-1 multiplexer, channel service unit or data service unit?

■ Fractional T-1 transmission supported: What type of fractional T-1 transmission does the device support — dedicated, switched or both?

■ Input supported: What types of inputs are supported by the product, such as data, video or other?

■ Configurations supported: What configurations does the product support, such as point-to-point, drop-and-insert or other?

■ Transmission facilities supported: What specific transmission facilities are supported with the device, such as fractional T-1/DS1, T-1/DS1, microwave and satellite?

■ Physical fractional T-1 ports supported: How many ports on the device are capable of supporting fractional T-1 connections?

■ Interleaving: Does the device use a bit- or byte-interleaving scheme?

■ AT&T tested: Has the device been tested by AT&T for compatibility at all existing or planned fractional rates?

■ Logical links per physical interface: How many logical fractional T-1 links can the device support on one physical interface?

■ Logical fractional T-1

bundles that can be multiplexed onto T-1 aggregate: How many logical links can the device multiplex onto the T-1 aggregate, both with and without an embedded supervisory channel?

■ T-1 and E-1 fractional service support: Can the device support both T-1 and E-1 fractional services?

■ Diagnostics and test capabilities: Can the device diagnose logical fractional T-1 bundles, as opposed to performing just T-1 diagnostics? Can the product do loop-back diagnostics on the logical fractional T-1 portion of a T-1 access line? Can the product send a test pattern?

■ Price range and average price: What is the price range and the average price for the product?

Chart 2 — Categories:

■ Intermediate bit rate support: Does the product support the intermediate bit rates of 64K bit/sec increments?

■ D4-compatible T-1 port: Does the product have a T-1 network port that is D4 frame- and format-compatible?

■ Simultaneous support for alternate mark inversion (AMI) and bipolar eight zero code substitution applications (B8ZS): Is the product capable of supporting both AMI and B8ZS applications simultaneously on the same line and on the same multiplexer?

■ Incremental hardware required for fractional T-1 connection: Is any incremental hardware required to complete a fractional T-1 connection?

■ Subrate digital data service (DDS) support: Does the device support subrate DDS (DS0-B) speeds?

■ DS0-level switching in proprietary mode and Digital Access and Cross-Connect System (DACS) customer-controlled reconfiguration (CCR) support: Can the product support DS0-level switching when operating in a

proprietary mode? Does the product support DACS CCR?

■ Companding conversion and signaling conversion/A-law and Mu-law conversion: Does the product provide companding conversion and signaling for T-1 to E-1 conversion? Can the fractional T-1 multiplexer perform A-law and Mu-law conversion for international fractional applications?

■ Pulse code modulation (PCM) support/mixed PCM channels: Does the device support PCM? Is the device able to mix network PCM channels with logical, proprietary multiplexed fractional T-1 bundles on the same fractional T-1 aggregate?

■ M44 adaptive differential PCM (ADPCM) on fractional T-1 aggregates: Does the product support M44 ADPCM on fractional T-1 aggregates?

■ Mixes fractional T-1 aggregates: Is the device able to mix network fractional T-1 aggregates with other aggregate technologies in the same system?

■ Direct T-1 access analog and DDS line connections for fractional T-1 access: Does the fractional T-1 multiplexer support directly connected analog lines for fractional T-1 access? Does the fractional T-1 multiplexer support directly connected DDS connections for fractional T-1 access?

■ E&M to loop-start or ground-start signaling conversion without external equipment: Does the product provide E&M to loop-start or ground-start signaling conversion without external equipment?

■ Integrated Services Digital Network interface support/same platform ISDN Primary Rate Interface (PRI) support: Can your product support an ISDN interface now? Can your product migrate ISDN PRI support on the same hardware and software platform?

— Daniel Briere

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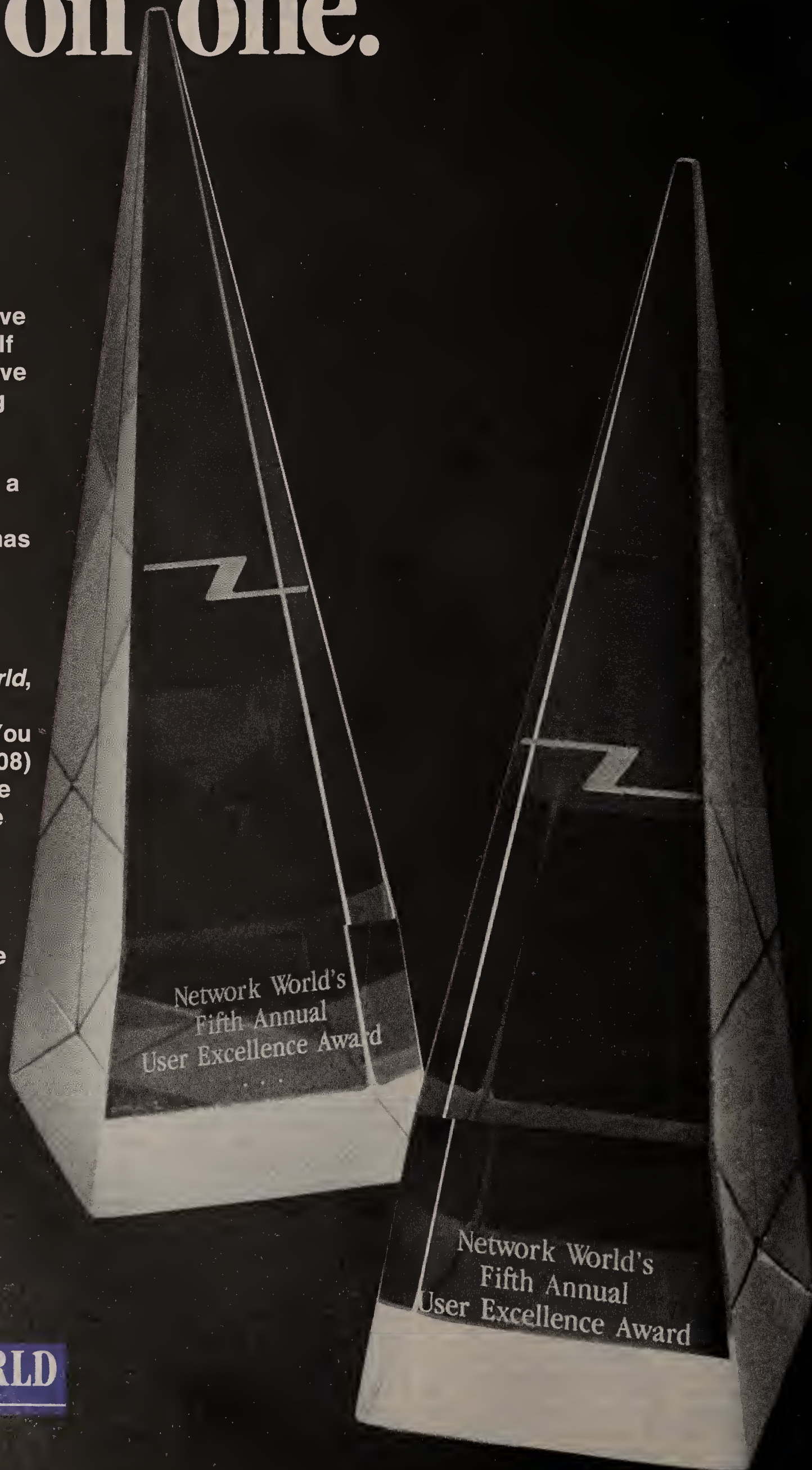
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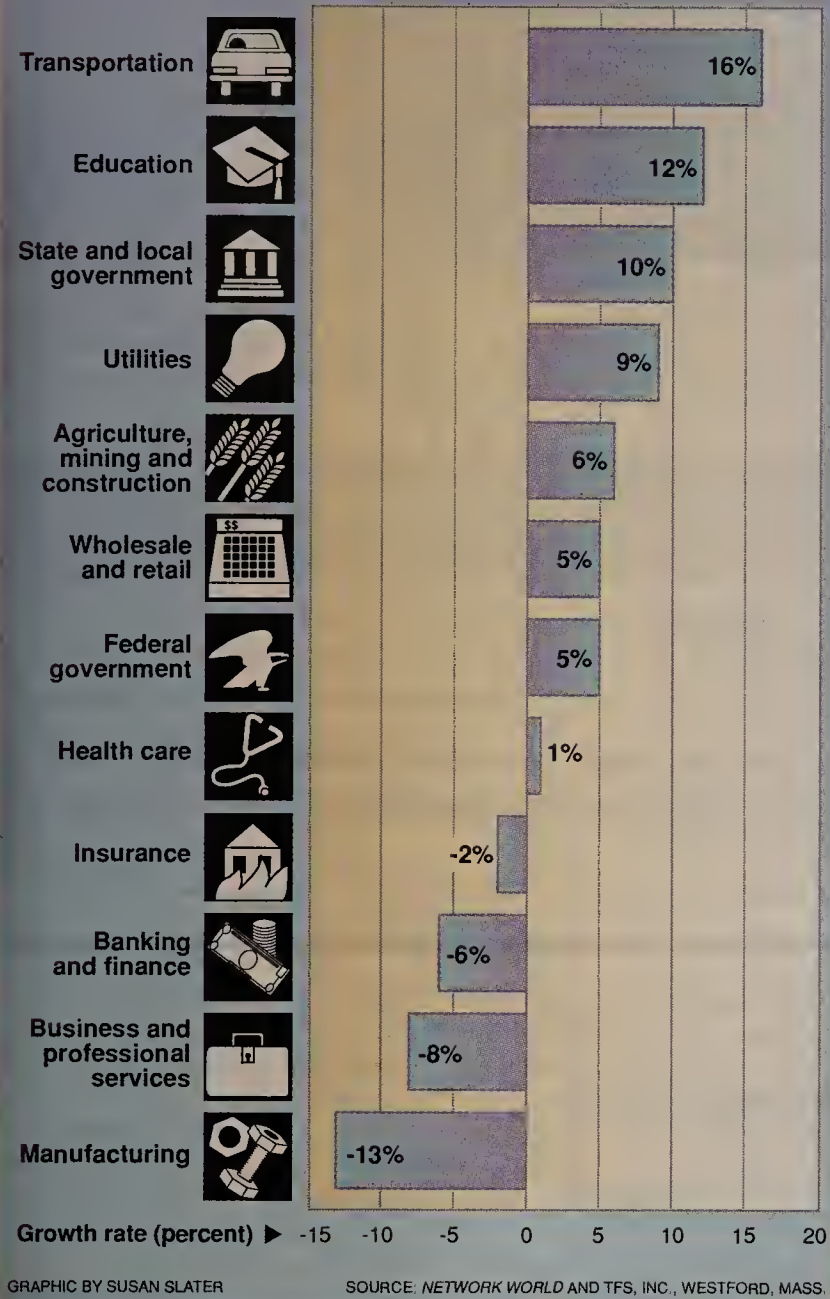
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How industries are growing

Figure 4

Expected changes in next year's budgets



(continued from page 52)

While budgets for state and local governments were above average, the average communications budget for federal government agencies was \$2.46 million, the lowest of all vertical industries.

Other industries found to have budgets below the average in this survey are health care, with an average 1990 communications budget of \$3.3 million, business and professional service organizations, with budgets of \$5.2 million, wholesale/retail groups at \$6.4 million and educational institutions with budgets of \$6.9 million.

Vertical spending

Each vertical industry has different communications needs. This is derived from the way the various line items — line charges, salary, equipment, training and so forth — are treated by each industry.

As was noted earlier, the survey found that overall, line charges constitute the largest portion of the average respondents' communications budget at 25.5%. Several industries allocate a much higher percentage of their budget to total line access charges (local and long distance).

Insurance companies, for example, devote 38.4% of their communications budget to line

charges. This was found to be the highest percentage of any vertical industry.

About two-thirds, 66.9%, of this charge is for long-distance service, which is also a higher percentage than the survey average of 59%.

The wholesale/retail industry, which budgets 38.1% for line access charges, follows closely behind insurance companies in the budget percentage allocated for line charges. Others on the relatively high side include federal government agencies at 32%, educational institutions at 29.9%, and agriculture, mining and construction firms combined at 28.2%.

Industries on the low side of communications budget allocated for line charges include business and professional service organizations at 13.5%, utility companies at 17% and health care institutions at 18.4%. Presumably, the professional service organizations are charging their access time to clients and, therefore, do not need to allocate as much of their budget to this line item as other industries.

As was stated previously, salaries accounted for 23.1% of 1990 communications budgets, making it the second largest line item overall. However, as with line charges, the survey found variations in the percentage of the budgets devoted to salaries be-

tween different vertical industries.

Business and professional service organizations, which set aside 35.8% of their budgets for salaries, dedicate the highest percentage of their communications budget to salaries. Other industries that earmark a higher-than-average portion of their budget to salaries include agriculture, mining and construction companies (as a group), and transportation and utilities companies. All allocate about 28% for salaries.

Insurance companies and wholesale/retail organizations set aside the lowest percentage of their budgets for salaries. These groups allocate 15.2% and 15.8% for salaries, respectively.

The industry variations are a combination of the economic outlook and each industry's needs, according to Gilbert. Certain sectors of the economy get hit harder than others. "It may be that farming and agriculture is hit one year and transportation has a boom year," Gilbert says.

"In this survey, you'll find banking and finance did reasonably well, even though the industry was impacted by the financial

branch exchanges, mentioned by 20.4% of those surveyed, were the leading item (see Figure 5). Second was network management equipment, which garnered 18.5% of the responses.

T-1 backbones, cited by 16.9% of the respondents, were next, followed by front-end processors

in spending by region. For comparison purposes, survey responses were organized according to their regional Bell holding company.

As is shown in Figure 1 on page 49, respondents in the Nynex Corp. and Southwestern Bell Corp. regions report the

Business and professional service firms dedicate the highest percentage of their communications budget to salaries.



at 13.2%, multiplexers at 7.5%, high-speed modems at 4.6% and matrix switches at 1.1%. All other equipment grouped together accounted for the remaining 17.8%.

Regional differences

When comparing responses from around the country, it is interesting to note the differences

highest 1990 operating budgets, at \$12.4 million and \$10.4 million, respectively.

Next in line are companies in the Pacific Telesis Group region, which have average operating budgets of \$9.5 million, and the Ameritech region, with budgets of \$9.3 million.

Rounding out the list are companies in the BellSouth Corp. region at \$8.6 million, in the US West, Inc. region at \$8 million, and in the Bell Atlantic Corp. region at \$5.6 million.

Some would argue that the higher budgets for companies in the Nynex region might reflect traditionally higher operating costs such as salaries or overhead. But this does not seem to be the case. Companies in the Nynex region allocate 25% of their budget for salaries and 6.1% for overhead. While both of these numbers are higher than average, neither is the highest in its category.

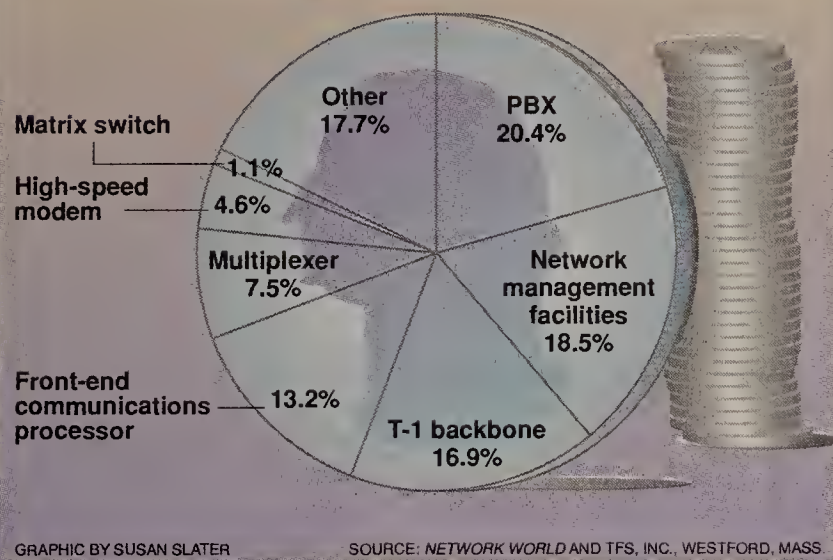
Companies in the BellSouth region allocate a larger percentage of their budget (6.4%) for overhead than other regions, while respondents from the Pa-

(continued on page 90)

Capital spending 1991

Figure 5

Which one piece of equipment will account for the largest part of 1991 capital budgets?



problems of the savings and loans," Gilbert says.

Hardware costs

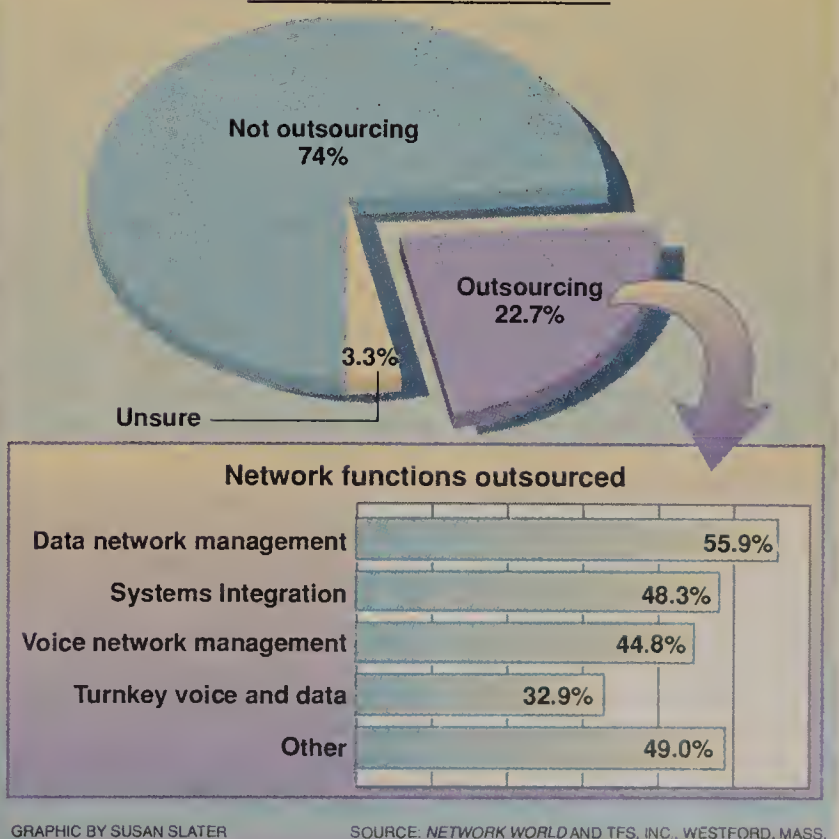
The survey found that 1990 capital budgets for those respondents with separate capital budgets averaged \$4.57 million, up more than 9.5% compared to 1989's figures of \$4.17 million. Unlike the overall communications budget dollar numbers, capital budgets are expected to keep increasing.

Respondents say they expect their 1991 capital budgets will grow to \$4.8 million. Where does this money go? About 46% of the capital budget is used to maintain the current level of service, 32% is used to add new services, and 22% is used to enhance existing services.

Managers were asked which one piece of equipment they expect would account for the largest component of their 1991 fiscal year capital budget. Private

Outsourcing trends

Figure 6



Fractional T-1 equipment (continued from page 63)

Vendor	Product	Product type	Fractional T-1 transmission supported	Input supported	Configurations supported	Transmission facilities supported	Physical fractional T-1 ports supported	Inter-leaving	AT&T tested	Logical links per physical interface	Logical fractional T-1 bundles that can be multiplexed onto T-1 aggregate (with/without embedded supervisory channel)	T-1 and E-1 fractional service support	Diagnostic and test capabilities	Price range/average price
Timeplex, Inc. (continued)	LINK/2+	Multiplexer	Switched, dedicated	Voice, data, image, video	Point to point, ring, tandem, drop and insert, bypass, mesh	Fractional T-1/DS1, T-1/DS1, microwave, satellite, twisted pair, fiber optic	7	Byte	Yes	208	11/24	Yes	Logical fractional T-1 bundle diagnostics; loopback diagnostics on the logical fractional T-1 portion of a T-1 access line; test pattern diagnostics	\$9,000 to \$75,000/\$42,000
Verilink Corp. San Jose, Calif. (408) 945-1199	Connect FT1	DSU/CSU	Dedicated	Voice, data, image, video	Point to point	Fractional T-1/DS1, T-1/DS1, microwave, satellite, fiber optic	1	Single-port device, no multiplexing	Yes	1	Not applicable/0	T-1 only	Test pattern diagnostics	\$2,750/\$2,750

CSU = Channel service unit
DDS = Digital data service

DSU = Data service unit
PRI = Primary Rate Interface

FOOTNOTES:

(1) Some of above configurations are supported when fractional T-1 access is used in conjunction with IDNX Transmission Resource Manager.
(2) The architecture of the 1564 allows peripheral Phoenix equipment to be attached via a bus connection into the T-1 media. This allows Phoenix to provide integrated devices such as the 1565 Subrate Digital Mux (20 ports per 1565).
This chart includes a representative selection of vendors in the fractional T-1 multiplexer market. Most vendors offer other fractional T-1 multiplexers, and many vendors not included offer a full range of competitive products.

SOURCE: TELECHOICE, INC., MANCHESTER, CONN.

The ups and downs

continued from page 89

cific Telesis region set aside a higher percentage (27%) of their budget for salaries than other regions. One reason for this may be that these regions have larger companies, which tend to be leaner and more efficient, according to Gilbert.

In addition to having the highest budgets, companies in the Nynex and Southwest Bell regions have something else in common. Their budget allocations for total line charges — local access and long distance — are the smallest percentage for companies in all seven RBHC regions.

For instance, Southwestern Bell companies devote about 21% of their communications budget to line charges, while Nynex companies spend 22.6% of their budgets on these charges.

In contrast, US West and Ameritech are the regions with the largest part of the budget going to line charges. Companies in these regions set aside 30.6% and 29.1% of their communications budgets, respectively, for these charges.

Outsourcing

As a cost-saving avenue, outsourcing has recently been identified as a new trend ("Changing user needs driving outsourcing," *NW*, July 2). Therefore, it seemed appropriate to ask network managers how outsourcing figured into their communications planning when they were considering their communications budgets.

Overall, 22.7% of the respondents are using some type of outsourcing (see Figure 6, page 89).

Many turn to outside help in managing their networks. Among those who outsource, 55.9% outsource management of their data networks and 44.8% outsource management of their voice networks.

Larger scale

Some companies sought outside help on a larger scale. For example, 48.3% of the respondents outsource systems integration, while 32.9% outsource entire turnkey voice and data networks.

US West's and Ameritech's regions have the largest part of the budget going to line charges.



According to our survey, communications managers do not expect budgets to increase in 1991, thus forcing them to explore cost-saving alternatives such as outsourcing to provide the equipment and services their companies need.

Besides outsourcing, companies will try to continue the trend of lower access charges. This will be accomplished by improved billing and tracking of telephone charges, more departments having their own telecommunications budgets and more companies charging the costs back to the departments. ■

Letters

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holding companies that have the double standard, but it is the federal regulation process that creates the double standard: It works in favor of foreign telecommunications companies and against U.S. customers.

First, the double standard permits foreign telecommunications companies to conduct basic research and to manufacture on U.S. shores while the RBHCs cannot. The RBHCs have pleaded, cajoled, lobbied, sought legislation and gone to court — but have realized very little positive response for this effort.

Second, the RBHCs' competitors for network services — namely AT&T, MCI Communications Corp. and US Sprint Communications Co. — are permitted more freedom in this area than are the RBHCs. Yet they are in the same business — serving the same customer — and are trying to provide the highest quality service at a declining unit cost.

Third, the major customer headquartered in the RBHC territory often has plants, branches and offices located internationally and expects troublefree end-to-end data communications to keep the company running. The RBHC should be able to deliver the kind of service this customer needs, be it within the RBHC territory or in another country. Instead, customers are left to fend for themselves and must work with a multitude of vendors and services — usually at much greater cost.

The double standards being applied to the RBHCs are causing the loss of U.S. jobs. In addition, the many restrictions imposed

through the U.S. regulatory process have given the RBHCs this impetus to shift investments internationally.

Earl Ross
Consultant
Birmingham, Mich.

Hypocrisy starts at home

I am writing regarding your condemnation of the regional Bell holding companies for hypocrisy ("RBHCs' double standard raises user hackles," *NW*, July 2). As usual, the accuser is more revealed than the accused. When you step into your foreign car, remember that you are using your own "profits" to take advantage of "incredible opportunities."

Why should we ask the RBHCs to "plow back" their profits into rebuilding American infrastructure if we as a society aren't willing to back them up? Your wage, your operating profit, is your sustenance and — if you are half as

prudent as you are glib — your own future. What will it be? Will you bet the farm on a good return or a poor one?

Build a case that by *not* investing at home now, the RBHCs are participating in their own ultimate demise. The long run is the only really interesting race to watch.

Rebuilding the American public net is something we should be ready to pay for ourselves, rather than expect someone else to do it while we stand by.

If you want to get rid of double standards, then try this: Make it clear up front that alleged profit-making advantages tendered to the RBHCs — or any other industrial group — will be preallocated to sensible and specific long-term social improvements so that nobody in the back seat will be tempted to call names later on.

Joe Hinrichs
Independent consultant
Dayton, Ohio

The cordless tie that binds

continued from page 40

work week over the 49-hour mark. There are no figures that tell us how many of those hours are spent leaving messages for people who left messages to call. Nor do we know how much time is spent responding to questions that we're asked only because of the availability of the instant-information-gratification system.

In the constant-contact future, it's easy to see an insidious expansion of work and a more insidious extension in the workplace. In the industrial age, the factory foreman controlled his workers from nine to five. In the informa-

tion age, workers are always available.

Today, it is possible to begin work with the first commuting mile on a cellular phone, continue it through a lunch accompanied by a personal communications network and end with a bedtime chat into your briefcase.

In 24-hour contact, we haven't missed a thing. Except, of course, the time for rumination, the solitude and space for the work we call thinking.

For years, the pitch of the telephone company was "Reach out and touch someone." Now we're all tied up, workers of the world united by the push button, and we need a new slogan. How about: "Let my people off the hook." ■

New transponders to ease link shortage

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Michael Mandigo, a Federal Communication Commission attorney.

Columbia filed a lawsuit with the Small Business Administration and, after documenting its fiscal soundness, was granted the transponder lease rights.

Columbia's contract with NASA will be financed through revenue received from lease holders. A line of credit with Banker's Trust Co. in New York has been arranged for the necessary working capital in the event of cash shortfalls from the leases.

Columbia must satisfy certain consultation procedures regarding operation of the C-Band transponders before the FCC can grant final approval of the project, Mandigo said.

Included in the article's provisions is a technical consultation in which Columbia must illustrate how the satellites will not interfere with other satellite systems operating in the same frequency. The company

must also undergo an economic harm analysis to determine if commercial use of the TDRSS satellites will cause undue economic hardship to INTELSAT.

"The operation of our system won't harm INTELSAT financially since the satellite capacity of all 24 transponders represents only 3% of the total global satellite capacity," Columbia's Laughton said. He also noted that INTELSAT's attempt to acquire the capacity precludes any argument concerning unfair competition.

Columbia's target date to begin service is next March, Laughton said. The consultation proceedings, which begin next week, typically take four to six months to

complete, according to the FCC's Mandigo.

Every Columbia/TDRSS transponder is capable of two-way, point-to-multipoint transmission, meaning a single transponder will be able to support a complete transatlantic or transpacific link. Direct access will be offered through customer-owned earth stations or via international gateway facilities.

Laughton said his company has already begun marketing the satellite capacity to video programmers and telecommunications carriers.

Although cable programmers and broadcasters interested in the international distribution of U.S. television programs represent the largest group of potential users, Laughton said the company is also looking at telecommunications carriers as

a secondary market.

"It's not likely we'll sell private-line service to end users, but instead, we'll lease satellite capacity to international telecom carriers that will then package private-line service to provide to corporate end users," he said.

Capacity on all 24 Columbia transponders is expected to be fully leased within one year, according to Andre Schwegler, vice-president of marketing and sales at SAT TIME, Inc., an independent reseller of satellite capacity and transmission services that will be the exclusive seller of the Columbia/TDRSS capacity.

Schwegler said Columbia will provide its customers with all the requisite U.S. operating licenses, as well as aid them in securing foreign government approvals. □

CMA chiefs discuss group's goals, plans

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Kopitowsky: Many data processing shops are turning to outsourcing, and I suspect in the next couple of years, the same will be true for communications departments. Wise managers will begin exploring outsourcing before senior executives initiate a dialogue with outsourcing vendors on their own.

But I suspect many large companies won't be able to reduce costs significantly by outsourcing their networks. These nets already provide them with great economies of scale.

My concern is that most outsourcing vendors will run a company's network as a utility and won't go that extra yard to suggest innovative ways their client can use technology to whip its competitors.

Do network managers perceive outsourcing as a threat?

Murray: I think so. Many people assume they will be out of a job if their company elects to outsource. But that isn't necessarily true. Many will continue to work at their company; others will be transferred to an outsourcing vendor, which could be a great opportunity for them.

What is the biggest technological challenge CMA members face?

Kopitowsky: It's becoming increasingly difficult to tell where technology is going. I suspect the rapid pace of change in the past five years will continue for the next five years.

This means we have to be able to conceive, sell, implement and write off [a communications system] very quickly.

Also, developing a staff that can absorb the changes and work in a multivendor environment will be challenging.

Murray: If people want to be successful, they have to devote a percentage of their work week to staying abreast of new technologies and sharpening their skills.

What steps can net managers take to become more business-oriented?

Murray: Communications managers have to meet with people in other departments, such as marketing or accounting. Communications managers should try to

(continued on page 92)

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CMA chiefs discuss group's goals, plans

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discover what forces are driving that person's part of the business. Often, that brings to light problems that can be easily resolved by communications.

Kopitowsky: It isn't enough any more just to provide a utility service and blindly give people what they request. If a department asks for a T-1 line, the communications manager should ask why they need it. Often, end users don't understand what technology best meets their needs.

Are companies moving to centralize or decentralize control over communications?

Kopitowsky: The answer is yes to both. Decentralization is seductive to end users because it's faster, cheaper and easier. By stringing some wire, inserting network cards and a network operating system, end users can create networks.

The downside is that eventually their network is not going to work well. They will experience performance problems and system failures and won't be able to communicate easily with mainframes. In five years, we'll see users needing more assistance and a majority of companies managing LANs centrally.

Network managers complain that there aren't enough skilled people to hire, yet many network professionals claim they can't find a job. Can you explain this situation?

Kopitowsky: It depends on what salary range you are looking at. Managers are having a difficult time finding qualified people at the engineering and senior analyst levels. On the other hand, there are many people who have been doing the same job for 10 or 15 years. These people are having a hard time finding new jobs.

In addition, there seem to be fewer senior manager positions in communications today. Growth in the field has stabilized. People have settled down and are no longer job-hopping every two years.

Companies have always had a hard time finding people with specific skills. Today, companies are searching for creative and bright individuals who are on the edge of new technology, such as imaging.

How can network managers ensure their "employability" in the next five years?

Murray: You are not going to be employable if you lock yourself in a closet, so to speak. You have to network with people through professional associations or user groups. This keeps you up to date with what's going on in the industry and helps you develop contacts with people who can help you land a job in the future.

Kopitowsky: Employers no longer want to know whether you can push paper or handle phone bills. They want to know what specific technical skills you can offer.

The generalist manager who doesn't have specific knowledge about the business or technology area is having a hard time in our industry, as in many industries.

What regulatory issues is CMA most concerned about?

Kopitowsky: The fact that there is a regulatory side at all is a concern. Regulations have changed as rapidly as technology in the past 10 years, and this makes it difficult to plan network strategies. Overnight, regulation can make your network

plans obsolete.

Murray: Many more companies are starting to take stands on regulatory matters, which they never did before. There was a fear that getting involved would backfire on a company.

Kopitowsky: In New York, the regulatory process is getting less adversarial. Instead of customers and phone companies screaming at one another over proposed rate hikes and service offerings, these groups are joining together. Users, telephone companies, and state and local governments are banding together to push the Public Service Commission to allow phone companies to improve the telecommunications infrastructure.

Are you saying regulatory com-

missions are impeding the growth and development of services that users want?

Kopitowsky: In some cases, yes, because their mission hasn't changed. The commissions have to evaluate the impact of new services on ratepayers. For example, the commissions have to investigate what impact a request by telephone companies to build alternate routing to their central offices would have on rates for residential customers.

Has CMA ever considered taking on more of a lobbying role?

Kopitowsky: We have moved slowly in that direction. We're not about to become a big lobbying organization. We have expressed an official opinion on issues that

affect large corporate users of communications services, such as taxes on communications services and call blocking. But lobbying is an expensive proposition, so we have proceeded with caution.

How is the economy affecting network budgets?

Murray: Managers are more concerned about cutting costs than ever before.

Kopitowsky: I see an acceleration of a trend in this country toward cost/benefit analysis. In some cases, the results of this analysis may lead companies to implement network projects quicker because there is a big payback, but if numbers aren't there, projects may be slowed down. **Z**

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This application heralds the introduction of a new concept in network management called the NYNEX ALLINK Network Management Solution. It will become a seamless, integrated network management system, streamlining everything from operations to

Videotex service speeds processing

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Mexico. GHMSI uses the Teletel protocol on Minitel Services Co.'s international network, which runs over Infonet Services Corp.'s X.25 net.

Hospitals place a voice call to GHMSI's service center in Washington, which uses videotex to access a patient eligibility data base, Hartley explained. Alternatively, foreigners seeking medical assistance can call into a regional service center, where personnel fluent in the caller's native language use the videotex net to access the eligibility data base.

The patient eligibility data base runs under the Pick Systems' Pick operating

system on an Intel Corp. 80386-based personal computer in the Washington office of Information Systems Experts, Inc., GHMSI's videotex application software vendor.

In the past, hospitals or clients called Washington or another service center, and another voice call was placed to the company's mainframe in Washington, where patient eligibility data was stored, Hartley said.

The corporate mainframe was not always available for user access, so requests received after-hours could not be answered immediately. Different time zones and holidays also made timely responses difficult. Corporate policy was to respond to requests within 48 hours.

Videotex, on the other hand, enables us-

ers to access the Pick data base whenever necessary. Furthermore, response time on a request for patient eligibility data is typically within three seconds.

"What we were really looking for was a system that was up 24 hours [a day] that you could access without going through massive problems," recalled Ruth McKenty, director for Asia and Europe at GHMSI's International Division.

Videotex also provides considerable cost savings compared to the older practice of placing an overseas voice call.

For example, a one-hour voice call from Washington to Paris costs \$64.25, while a one-hour call from Paris to Washington costs \$83.79. Over the videotex network, a one-hour data transmission from Washington to Paris costs \$10.20 and a one-

hour transmission from Paris to Washington costs \$28.20, McKenty said.

In addition, low-quality telephone networks in other countries often necessitated multiple calls to establish, or in some cases to reestablish, a connection. "Try to call Caracas [Venezuela]," McKenty said. "You'll probably make seven phone calls to get one through."

GHMSI has not yet compared the costs of videotex and voice calls on an annual or monthly basis, but its May videotex costs totaled \$408. If that figure is taken as a monthly average, the annual cost is under \$5,000, "which is very reasonable," McKenty said.

Videotex is also used for store-and-forward electronic mail. Using videotex for E-mail between Washington and Mexico, for example, costs 50% less than long-distance voice calls between the locations, McKenty said.

Videotex proved to be the only cost-effective option, considering the cost of installing leased lines or satellite links.

GHMSI estimated that a fiber-optic circuit linking the U.S. to Europe would have carried a \$500,000 start-up cost, including hardware. The company never did a cost analysis of satellites because "it was too frightening," McKenty said. "Videotex was so much cheaper that it wasn't even an issue."

Start-up costs for videotex were about \$50,000, she said.

Because of the success of its initial applications, the company will now use videotex in Ireland and possibly more sites as the company expands to other locations, further reducing the costs associated with international communications.

It is also weighing the use of videotex for other applications, Hartley said. For example, it could be used by salespeople, who could carry videotex communications software, load it on a customer's personal computer and access the company mainframe for information such as price quotes. In a financial application, accountants at corporate headquarters could access financial information from remote sites via videotex. □

Congressmen balk at FCC plan

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dominance. We're big, I'll admit that. But what does that do for you?" he asked. "We can't control the market. MCI can't control the market. No one can."

During a panel discussion, Richard Firestone, chief of the FCC's Common Carrier Bureau, put forward the commission's reasoning in initiating the rulemaking proposal. Firestone said the FCC wanted to stop grappling with the legal dilemmas of Tariff 12, which combines customized network services for a discount, and Tariff 15, which are AT&T's customer-specific discounts made to counter a competitor's customer-specific discount.

"The FCC decided it was uncomfortable making these decisions," Firestone said. "There are many customers who don't want the federal government interfering in their ability to select vendors."

But James Smith, president of COMPTel, spoke for the trade organization's membership of small long-distance carriers when he said, "What we're disappointed about is that instead of studying the market since divestiture, the FCC proceeded immediately to a deregulatory proceeding that assumes a lot of facts." □

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FCC adopts revised LEC price caps

continued from page 1

mine whether to permanently adopt or rescind the regulatory scheme.

In a parallel decision, the FCC lowered by almost 1% the rate of return for all local carriers, a move that will cut rates under the price cap plan by an additional \$317 million. The rate of return is a key factor in determining the initial levels at which prices will be capped. It also serves as a benchmark against which carrier profits will be controlled.

Unlike AT&T's price cap plan implemented last year, the local carrier plan places limits on carrier profits.

The new system will cap rates for ser-

vices at current levels. Future increases will be based on a complicated formula that holds increases at a level below inflation and considers factors such as depreciation, and tax and regulatory changes.

Long distance carriers and users have questioned whether price caps will drive prices lower than they would fall under rate of return. They have also expressed concern that carriers might delay net upgrades and cut service in order to reduce costs and maximize profits.

FCC Chairman Alfred Sikes last week downplayed these concerns, insisting that the plan balances the interests of ratepayers and carriers.

The local exchange carriers applauded the decision to implement price caps but expressed concern about changes to the

plan, particularly reduction of the rate of return from 12% to 11.25%.

Another major change was an increase in the productivity factor, which determines how far below the inflation rate increases will be kept. The FCC had originally called for a 3% productivity factor, but then raised it to 3.3% to increase customer savings.

The FCC also reworked the mechanism that caps profit levels. If carriers choose a 3.3% productivity factor, they can earn up to 1% above the rate of return, or 12.25%. If they earn between 12.25% and 16.25%, the carriers must give 50% of the profit above 12.25% back to their customers. Any profits earned above 16.25% must go back to users.

The FCC also revised service categories

to address concerns about strategic pricing. The commission has set three service categories, referred to as baskets: common line charges, traffic-sensitive switched access, and other services including special access.

But the FCC last week split special access services into a separate basket. This is significant because the new regulatory plan caps prices for a basket as a whole. A carrier is free to raise or lower prices for any service by 5% as long as aggregate prices don't exceed the cap on the basket. By moving special access into its own basket, carriers will have a tougher time targeting high-capacity services for price increases.

User reservations

Brian Moir, counsel for the International Communications Association, said he is waiting for the full text of the FCC order, which should be released by Oct. 1. However, he did express reservations on what he has seen so far.

"We are troubled that the FCC has not made any predictions as to what rates would be today if price caps had been in effect since 1985," Moir said.

Moir said it is unclear how much of the savings from the price cap plan will end up in the pockets of end users. In order for end users to benefit, long-distance carriers will have to pass along savings realized from reduced access charges. Since AT&T also operates under a price cap formula, in which cost changes such as reduced access charges are only one variable, it is unclear how much savings will actually trickle down to consumers. ■

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Cabletron introduces SNMP management

continued from page 4

the Device Communication Manager, which translates information from the individual device formats into the format supported by VNM. Translation is required because each vendor's SNMP implementation is unique and other protocols are supported.

VNM also consists of an artificial intelligence component, known as Inductive Modeling Technology (IMT). To use IMT, network managers define attributes of nodes or devices in the network to build an object-oriented data base. The product uses this information to determine causes of network failures by sifting through alarms generated by multiple devices.

Spectrum is expected to be available in January at prices ranging from \$50,000 to \$150,000. Management Modules for other products range from \$1,000 to \$10,000. Cabletron will offer gateways to NetView and OSI nets using CMIP in 1991.

Multivendor support is a key requirement at Texas A&M University, which is beta-testing the product in a 3,000-node Ethernet dispersed over 35 to 40 buildings, said Walt Magnussen, network planner for the university. The net uses tools from vendors including Cisco Systems, Shiva Corp. and 3Com. Similarly, Fidelity Telecommunications Co., a division of Fidelity Investments in Boston, is testing the product to manage an evolving LAN inter-network supported by Cabletron hubs and Cisco Systems routers, said Lisa Lochiatto, technical consultant at Fidelity.

The client/server architecture is also a requirement at Texas A&M. "There are a number of different places we need to be able to monitor from," Magnussen said. ■

Graphical user interface key feature

continued from page 2

ther DOS- or OS/2-based workstations modified with Xerox hardware, or the Xerox 6520 workstation, a modified version of a Sun Microsystems, Inc. SPARCstation.

To support GlobalView from Intel Corp.'s 80286-, 80386- or 80486-based DOS or OS/2 clients, users have to install a Xerox coprocessor board based on a proprietary microprocessor and a proprietary multitasking operating system.

The coprocessor board enables the microcomputers to execute multiple tasks concurrently.

DOS clients must also run the OS/2 operating system to function as a device driv-

er for equipment such as printers and hard disk drives.

Because the Unix clients run the Sun operating system and supports X/View — Sun's implementation of the X Window System — the Xerox 6520 can run any X/View-compliant application.

Application support

The GlobalView software provides low-level user productivity applications such as E-mail and a document editor. It also offers a portable desktop, which enables users to decide whether the graphical user interface will be generated by their own workstation or from the Xerox server. When generated by the server, the same graphical user interface will greet the user when logging onto any node. GlobalView's

portable desktop capabilities are made possible by the software's distributed directory service, which enables all directories in a network to be simultaneously updated when one directory is changed.

In addition to the basic functions, GlobalView supports sophisticated groupware applications such as DocuTeam. DocuTeam runs on a Digital Equipment Corp. VAX connected to the same Ethernet as GlobalView clients on top of an Oracle Corp. data base.

DocuTeam extracts structured data, such as graphs and charts created as part of a project, and stores them as separate files on an Oracle data base. This allows users to view key data gathered as part of the project without searching through all notes and documents relating to the project.

Xerox is selling the Scalable Processor Architecture-based workstation bundled with GlobalView software and an Ethernet interface board for \$3,995. DocuTeam costs \$20,000 and will support 10 GlobalView clients.

All of the new products will be available in November.

Although the product's list price is relatively high, the productivity benefits it can bring to technical personnel and end users will enable them to cost-justify GlobalView, according to John Dunkle, vice-president of Work Group Technologies, Inc. in Hampton, N.H.

By masking the complexities of Unix, for example, under a graphical user interface, it will reduce the amount of technical support that users require, Dunkle said. **■**

MCI set to announce ISDN PRI service

continued from page 2

of Prudential-Bache Securities, Inc. "The strategy here is to offer large MCI customers another key reason to head back toward its switched network."

The ANI feature, which provides PRI users with the telephone numbers of incoming callers, carries a onetime \$300 installation charge per PRI link, plus 1 cent for each number delivered. AT&T charges 2 cents and US Sprint charges 1 cent per number delivered.

However, as an incentive, MCI said in its filing that it is waiving the \$300-per-PRI installation charge for ANI "until further notice."

MCI's Call-by-Call Service Configuration feature, which is priced the same as US Sprint's, has a \$250-per-PRI establishment fee. The feature allows customers to reconfigure B channels to support different services, instead of having to dedicate each channel to a particular service. Users must pay \$200 each time they rearrange their trunk group.

Call-by-Call Service Selection is free from AT&T. The carrier first charged a \$250-per-PRI establishment fee for its call-by-call service selection feature and \$200 for each rearrangement, but it eliminated both charges in December 1989.

MCI Call-by-Call Service Configuration can be used in the following combinations: Vnet/MCI 800 or Prism 1/MCI 800. Users must specify when they order PRI whether they want Call-by-Call Service Configuration and which combination they want.

If the PRI is initially dedicated to a single service, it can be reconfigured to support Call-by-Call Service Configuration for a onetime \$200 charge. Each time a service is added or deleted from a PRI trunk group, the user pays \$200.

It's about time . . .

Liza Draper, Enterprise Network Strategies program director at Gartner Group, Inc.'s Washington, D.C. office, said MCI's PRI filing is long overdue.

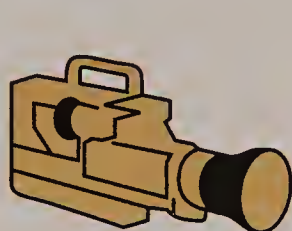
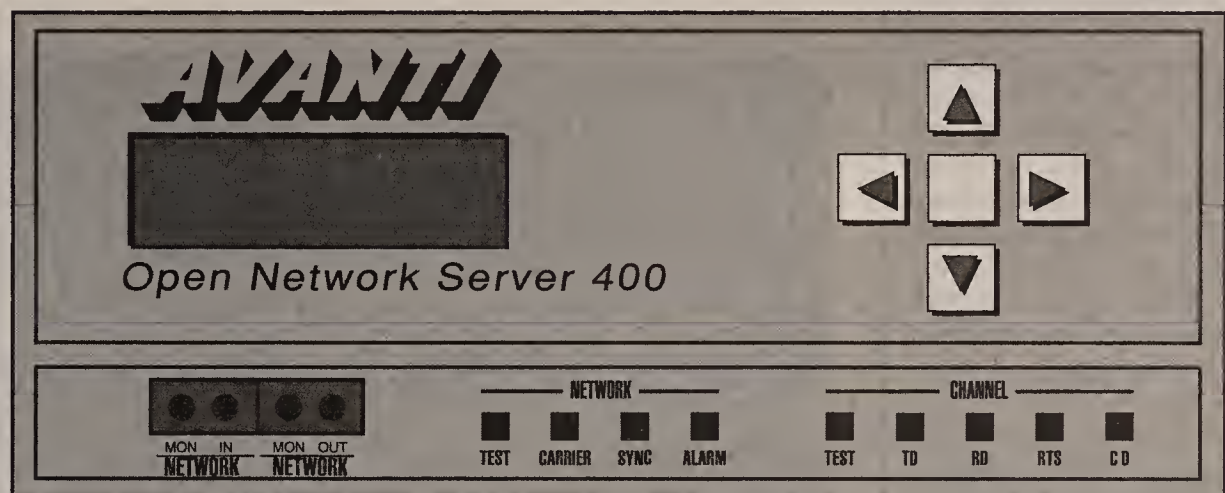
"All this filing really does is bring MCI up with AT&T, which tariffed PRI in 1988, and US Sprint, which followed in May of this year," Draper said.

Before the PRI filing, MCI focused its efforts on marketing ISDN-equivalent services.

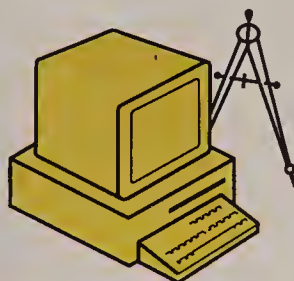
One of the offerings, Enhanced Services Package, uses inband signaling to provide calling number identification with incoming calls to users with dedicated access facilities.

(continued on page 99)

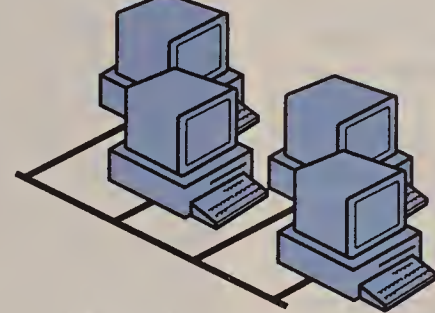
More ports than a Caribbean cruise.



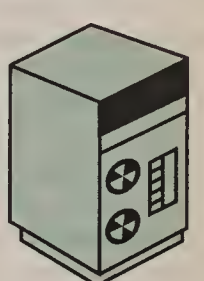
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RBHCs take user-by-user tack

continued from page 1

Because all seven RBHCs are deploying ISDN based on customer demand, only specific central offices are being upgraded.

"We aren't going to equip every central office and every access line for ISDN because we don't want to force it down customers' throats," said Robert Meldrum, large business systems marketing communications manager for US West Communications in Englewood, Colo.

"It's not the high penetration a lot of people thought we'd have by this time," he said. "But if you look at what's happened in the market as far as standards, CPE development, switch development and [Common Channel Signaling System 7], we couldn't have done much more."

The RBHCs, which began deploying CCS7 in the mid-1980s, now collectively support only about a quarter of all local access lines from CCS7-equipped central office switches. The RBHCs don't expect to have CCS7 fully deployed until the turn of the century.

These and other issues have persuaded at least two RBHCs — Bell Atlantic Corp. and BellSouth Corp. — to take a wait-and-see attitude about ISDN.

"We are not actively selling ISDN," said Jack Hullings, ISDN services product manager for BellSouth Services, Inc. in Atlanta. "We have not actively advertised ISDN service and have not been very active in promoting ISDN's capabilities."

BellSouth has, however, met with customers to discuss ISDN capabilities. "We want to give customers services they can buy today that provide some ISDN functions and will position them for ISDN in the future," Hullings said.

BellSouth has held back ISDN deployment as it awaits completion of equipment standards. "We recognize that the standards are evolving and the industry's in a state of flux," Hullings said. "It would be expensive for our customers to buy initial ISDN CPE knowing the [station equipment] would have to be upgraded or replaced as standards are set."

Bell Atlantic has adopted a similar stance. "We're still not marketing ISDN aggressively," said Bell Atlantic spokesman Lawrence Plumb. "It's certainly a promising technology, but until there is interoperability [among] different vendors' [central office] switches and between central offices and customer premises equipment, it's a go-slow process."

Steve Sazegari, senior industry analyst with Dataquest, Inc., a San Jose, Calif., consultancy, said the RBHCs may not have the switch software and CCS7 links required to connect ISDN islands for some time. "We'll begin to see interconnection of these islands in about three to five years," Sazegari said.

Although they have been deploying ISDN for several years now, only one RBHC — Ameritech — has filed a general tariff for ISDN service, while many others have filed conditional, temporary and starter kit tariffs.

However, the remaining RBHCs plan to file general tariffs for ISDN Basic Rate Interface service and Primary Rate Interface service within the next 18 months (see "RBHC deployment plans for ISDN offerings," page 97).

Carriers opted to first use customer-specific proposals in an effort to gauge user demand for ISDN and determine what customers were willing to pay for various

RBHC ISDN deployment plans

RBHC	Year	Central office switches		Access lines (thousands)	
		Total offices	ISDN equipped	Total lines	ISDN configured
Ameritech	1990	1,156	69	16,247	43.7
	1994	1,154	153	17,662	122.4
Bell Atlantic Corp.	1990	1,336	102	17,819	14.5
	1994	1,343	1,164	20,246	247.1
BellSouth Corp.	1990	1,654	35	17,574	335.0
	1994	1,637	345	20,243	1,605.0
Nynex Corp.	1990	1,320	34	15,515	22.5
	1994	1,302	53	17,489	52.5
Pacific Telesis Group	1990	826	35	14,176	5.5
	1994	832	120	16,219	42.2
Southwestern Bell Corp.	1990	1,342	45	11,970	29.0
	1994	1,336	96	13,290	85.0
US West, Inc.	1990	1,772	86	12,564	46.1
	1994	1,762	121	13,799	62.3

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: FEBRUARY FILING, FCC, WASHINGTON, D.C.

ISDN line configurations, analysts said.

"It's better that the RBHCs stick with [customer-specific plans] until they get a clearer idea of what the market is willing to bear before they file general tariffs," said Richard Kuehn, president of RAK Associates, a consultancy in Cleveland.

Kuehn served six months on a US West Communications committee charged with the task of developing a framework for ISDN pricing. "We couldn't figure out what [the RBHC] should charge customers for ISDN," Kuehn recalled. "All we came up with was the idea of charging users 1½ times the cost of a Centrex line," he added.

Sazegari said most RBHCs offer customer-specific ISDN services at rates 50% less than Ameritech's tariffed ISDN rates.

James Devine, Ameritech's services

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product planning director, said the company will continue to use customer-specific proposals for large customers that want 50 or more lines. Illinois Bell Telephone Co.'s April 1988 ISDN filing only gave pricing for companies that wanted to buy fewer than 50 ISDN lines.

Customer-specific proposals "let us [recoup] the cost of providing the service, instead of averaging it across the rate base," Devine said.

The RBHCs offer customer-specific ISDN proposals primarily to users in major metropolitan areas. For example, US West offers ISDN in the following cities: Denver, Minneapolis and St. Paul, Minn., Omaha, Neb., Phoenix, Portland, Ore., and Seattle, and it will soon begin offering service in Des Moines, Iowa, and Salt Lake City. **Z**

RBHC deployment plans for ISDN offerings

■ **Ameritech** — The carrier has 36,000 Integrated Services Digital Network lines installed for 50 customers. The regional Bell holding company offers ISDN in at least eight cities — Ann Arbor, Mich., Champaign, Ill., Chicago, Cleveland and Columbus, Ohio, Milwaukee, Schaumburg, Ill., and Southfield, Mich. — and plans to file a general Primary Rate Interface (PRI) tariff in the first quarter of 1991.

■ **Bell Atlantic Corp.** — The RBHC has 4,500 lines for 25 to 30 customers. It offers ISDN in at least six cities — Bedmin-

ster and Livingston, N.J., Morgantown, W.Va., Pittsburgh, Richmond, Va., and Washington, D.C., — and plans to tariff Basic Rate Interface (BRI) and PRI in the first quarter of 1991.

■ **BellSouth Corp.** — BellSouth has 1,500 to 1,800 lines installed for 25 to 30 ISDN customers. The RBHC offers ISDN in Atlanta and Gainesville, Fla., and plans to tariff BRI and PRI in the first quarter of 1991.

■ **Nynex Corp.** — The RBHC has 12,000 lines installed for seven ISDN customers in the Boston and New York metropolitan

areas. It plans to tariff BRI in a few days but will not file a general tariff for PRI until the second quarter of 1991.

■ **Pacific Telesis Group** — This RBHC has 1,400 lines installed for 15 ISDN customers.

Pacific Bell, a local operating company of Pacific Telesis Group, offers ISDN in 20 cities, including Los Angeles, San Diego, San Francisco, San Jose, San Ramon, Sunnyvale and Sacramento, Calif. Pacific Telesis has a provisional tariff that enables it to offer BRI service until 1992, and it plans to file a PRI tariff in October.

■ **Southwestern Bell Corp.** — The carrier has 23,000 lines installed for 20 customers. It offers ISDN in seven cities — Austin, Dallas, Houston and San Antonio, Texas, Little Rock, Ark., Oklahoma City and St. Louis.

No plans have been made to tariff BRI, but PRI is slated to be tariffed in early 1992.

■ **US West, Inc.** — US West has 12,000 lines installed for 35 ISDN customers. The RBHC currently offers ISDN in seven cities — Denver, Minneapolis and St. Paul, Minn., Omaha, Neb., Phoenix, Portland, Ore., and Seattle — with plans to offer it in Des Moines, Iowa, Salt Lake City and in Montana. In addition, the RBHC plans to tariff BRI and PRI by mid-1991. **Z**

— Bob Wallace

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MCI fortifies int'l presence with OTI

continued from page 6

The OTI acquisition, if approved, would be MCI's fourth this year (see graphic, page 6).

Applauding MCI's move was Tom O'Toole, director of communications systems for Westinghouse Communication Systems, a division of Westinghouse Electric Corp. that is both an MCI and OTI user.

"I don't think MCI could have internally developed the [international business satellite services] they'll be getting from OTI," he said. "MCI's acquisition strategy has been successful in giving the company a bigger position internationally."

Mark Lowenstein, a telecommunications analyst at The Yankee Group, a Boston consulting firm that will soon issue a report on the domestic and international private-line market, estimated that MCI has as much as a third of the \$380 million international private-line market already. AT&T, he said, is the market leader. "This announcement shows MCI's commitment to the international private-line business and its desire to compete with AT&T in all parts of the world," Lowenstein said.

Charles Nichols, a vice-president at Prudential-Bache Securities, Inc. in Boston, said the international market has become attractive to MCI in that "profit margins for international services are significantly higher than margins on domestic services," where competition is more intense.

Following the required government approvals, MCI plans to combine all international private-line services under a new as yet unnamed business unit in the MCI Enterprise Group. OTI's chief executive officer, president and founder, K. Paul Singh, will head that unit. **Z**

Gary Augustson

As the force behind PREPnet, Augustson strives to electronically unite Pennsylvania's universities, corporations and research institutes.

by Amy Berman

Gary Augustson doesn't talk much about robbing the rich, but he certainly expects them to help pay for the poor.

His tool for reversing the inequities of economic distribution is the Pennsylvania Research and Economic Partnership Network (PREPnet). PREPnet may be the country's first regional network specializing in education, research and technology transfer to be subsidized by a combination of state government, private industry and membership fees from large institutions.

PREPnet is already linking Pennsylvania's leading schools and businesses — as well as some less-endowed academic and commercial cousins — with the rest of the electronic universe. According to Augustson, Pennsylvania State University's de facto senior information strategist and the guiding force behind PREPnet, "The goal of PREPnet is to make connectivity affordable for all of our partners in Pennsylvania."

Like most of the country's two dozen or so regional networks, PREPnet — a T-1 based Transmission Control Protocol/Internet Protocol network — has a two-fold mission: to foster education and encourage research through electronic communications.

But PREPnet also has another goal: economic development. Its founders hope PREPnet will help technology start-ups and other new companies decide to do business in Pennsylvania because of easy and inexpensive access to electronic resources.

"We want to heighten the linkages between industry and higher education," Augustson says, "so a company no longer has to worry about the fact that the best researcher in petroleum engineering, for example, is in State College, Pa., 200 miles away from their research plant in Philadelphia. The network lets them collaborate as though they're in the same building."

Some rough estimates place

Berman is a free-lance writer based in Jamaica Plain, Mass.

current PREPnet usage at about 25,000 nodes, though Augustson warns that accurate calculations are impossible because of the system's transparent links and the lack of a tracking mechanism.

In his official position as executive director of computer and information systems at Penn State, the 44-year-old Augustson's duties — and \$35 million budget — encompass telecommunications, academic computing, administrative computing and library computing activities for the 23 campuses that compose the university's system.

Augustson earned a bachelor's degree in mathematics from the University of Michigan and subsequently received the first master's degree in computer science awarded by the University of Maryland. Augustson, however, describes himself as a manager who happens to be technical. Presumably, Next, Inc. and Xerox Corp. concur: He serves on both companies' advisory boards, as well as on Educom's National Telecommunications Task Force.

Educom is an annual conference designed to give academic technologists an opportunity to explore common concerns and discuss network technologies and information systems strategies.

For 16 years, Augustson handled various technology tasks for several federal agencies, including the National Security Agency, where he

held a series of positions in research and development; the Office of the Secretary in the Department of the Treasury, where he ran a large departmental computing center; and the U.S. Information Agency, where he was director of technology.

Augustson returned to academia as special adviser to the president of Penn State in 1982.

Like many good ideas, PREPnet was born from chance. About five years ago, Augustson and computer managers at other Pennsylvania colleges, such as Carnegie-Mellon University and the University of Pittsburgh, began discussing some common computing concerns. They soon realized their various schools could benefit from their common



experiences — and from pooling resources.

The first efforts to establish PREPnet began in 1987, when corporate sponsors and other members were sought. Today, demographic data bases, medical indexes, library catalogs and agricultural information are among the on-line services that PREPnet provides. Thousands of other sources are available through Internet, including the National Science Foundation Network (NSFNET) and its five regional supercomputing centers.

Since 1988, the network's steering committee has persuaded 15 schools and a dozen companies and research institutes to join Augustson's brigade for electronic equality. To join PREPnet costs about \$25,000 in connection, membership and maintenance fees for the first year. However, members' fees cover just 15% of the network's estimated annual \$1.2 million budget.

But by adhering to its mandate to serve only the state of Pennsylvania, Augustson's group has convinced state government to underwrite a significant share of the cost. The state provides the T-1 backbone between the two major hubs, in Pittsburgh and Philadelphia, as well as a 56K bit/sec line link to one of the network's two major hubs. PREPnet pays for three other hub connections, and members underwrite their own connections to the closest hub.

Bell Telephone Co. of Pennsylvania, the other major donor, contributes three staff people and "a significant amount of cash" to the group. Augustson says he hopes the state will soon commit to an annual cash contribution as well.

"The charity isn't intended to go on forever," Augustson says. "We've got a budget that calls for PREPnet to be self-sustaining in three years."

For now, though, the biggest membership dues come from the network's two largest — and earliest — corporate sponsors: USX Corp.'s (formerly U.S. Steel's) Technical Center, based in Pittsburgh, and Unisys Corp., based in Philadelphia.

Membership dues favor small, nonprofit universities and start-ups, which pay as little as \$1,000 yearly. The largest commercial enterprises, however, pay \$15,000 per year. Even this pricing is substantially discounted to attract newcomers. In fact, the 1990 dues are based on what it might cost if 125 participants — not 27 — shared the network.

"You can connect at T-1," he says, "but if that's not affordable, you can connect at lower speeds, all the way down to 9.6K bit/sec."

The T-1 connection costs \$11,900, while linking at 56K and 9.6K bit/sec each costs \$9,800. The difference increases over time because monthly maintenance costs can differ by another \$60.

Two schools — Susquehanna University, in Selinsgrove, Pa., and La Salle College, in Philadelphia — use dial-up connections to cut costs still further. Three schools — Byrn Mawr College, Haverford College and Swarthmore College — in suburban Philadelphia have managed to share a single T-1 connection.

Though speeds may vary, all network nodes must establish a TCP/IP connection. Because the communications protocol rarely interacts with the operating system used on the various campuses, it doesn't matter that a half-dozen different environments are in use, including Unix, DOS, Digital Equipment Corp.'s VMS, IBM's VM and Apple Computer, Inc.'s Macintosh OS.

On his own desk, Augustson says he works on a Macintosh one week and an aging IBM Personal Computer the next. "I use whatever they give me," he says.

And though a technical manager with his background could surely parlay his skills into a lucrative corporate networking job, Augustson says he's staying at Penn State.

"I think I've had a lot of impact [here]," he says, and pausing briefly, quickly computes the far smaller effect he had during nearly two decades of federal service. "In a large organization, it's very difficult to get things done." ■

NCR unveils scalable server line

continued from page 2

NCR will follow up the System 3000 rollout by announcing its Cooperation cooperative processing software and architecture, and open intelligent networking system and network management tools.

The whole package fits under NCR's Open Cooperative Computing Strategy, an application development architecture announced in February ("NCR architects net application strategy," *NW*, Feb. 19).

Last week, NCR unveiled six models for its new line.

The most powerful of the new models is the NCR 3550, a mainframe-class super-server that uses two to eight processor boards, each based on 50-MHz Intel Corp. 80486 microprocessors that together provide a total of 80 to 320 MIPS. It comes with 16M to 256Mbytes of memory, and up to 13G bytes of internal storage.

The system, which uses the NCR Unix V.4 operating system, can support more than 1,000 direct terminal or local-area network connections.

Prices range from \$100,000 to \$800,000, with first customer shipments scheduled for the second quarter of 1991.

The NCR 3450 is an entry-level, multi-processor server operating under AT&T's Unix System V.4 operating system. The server supports as many as four processors, each based on a 50-MHz Intel 80486 microprocessor, and provides 40 to 160 MIPS. The NCR 3450 supports as many as 256 connections in any combination of direct terminal or LAN attachments.

It comes with 4M to 256M bytes of memory, internal disk storage options of 6G bytes and external disk storage options of up to 50G bytes.

The NCR 3450 is priced from \$35,000 to \$200,000, with customer deliveries beginning in the second quarter of 1991.

The NCR 3445 is a uniprocessor server based on a 33-MHz Intel 80486 microprocessor that provides 27 MIPS of performance. It can support as many as 128 connections in any combination of direct terminal or LAN attachments.

Memory options include 4M to 64M bytes, and internal disk storage options of up to 3.3G bytes.

The NCR 3445 is priced from \$20,000 to \$85,000 and is available now.

The 3400 and 3500 machines are comparable to Compaq Computer Corp.'s SystemPro and Sequent Computer Systems, Inc.'s servers, said Tom Willmott, a vice-president at Aberdeen Group, Inc., a Boston consulting firm.

NCR's servers stack up favorably against Compaq's SystemPro, said Chuck

Barney, director of the Competitive Analysis Service at WorkGroup Technologies, Inc., a Durham, N.H.-based consulting firm. While the SystemPro offers dual processing, NCR is offering as many as four processors on the 3400 line and up to eight processors on the 3550.

"NCR's got Compaq beat on horsepower," Barney said. "NCR is also offering the flexibility to run both Unix and OS/2, and that's attractive for users seeking client/server environments."

NCR released three other uniprocessor servers: the NCR 3320, 3340 and 3345, each of which can function as a workstation or entry-level work group server.

Those servers range in price from \$4,000 to \$60,000 and are shipping now. **■**

MCI set to announce ISDN PRI service

continued from page 95

"[This] gives MCI a great opportunity to migrate customers using inband ANI to out-of-band ANI," said Daniel Briere, president of TeleChoice, Inc., a telecommunications consultancy located in Montclair, N.J. Users will find it's better to receive ANI before the call than with the call, he added. Receiving ANI before the call speeds call processing.

With inband ANI, the calling party's telephone number is passed in front of the call on the same circuit.

With PRI, ANI is passed over a separate signaling network and arrives before the call. **■**

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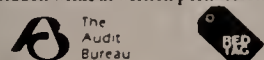
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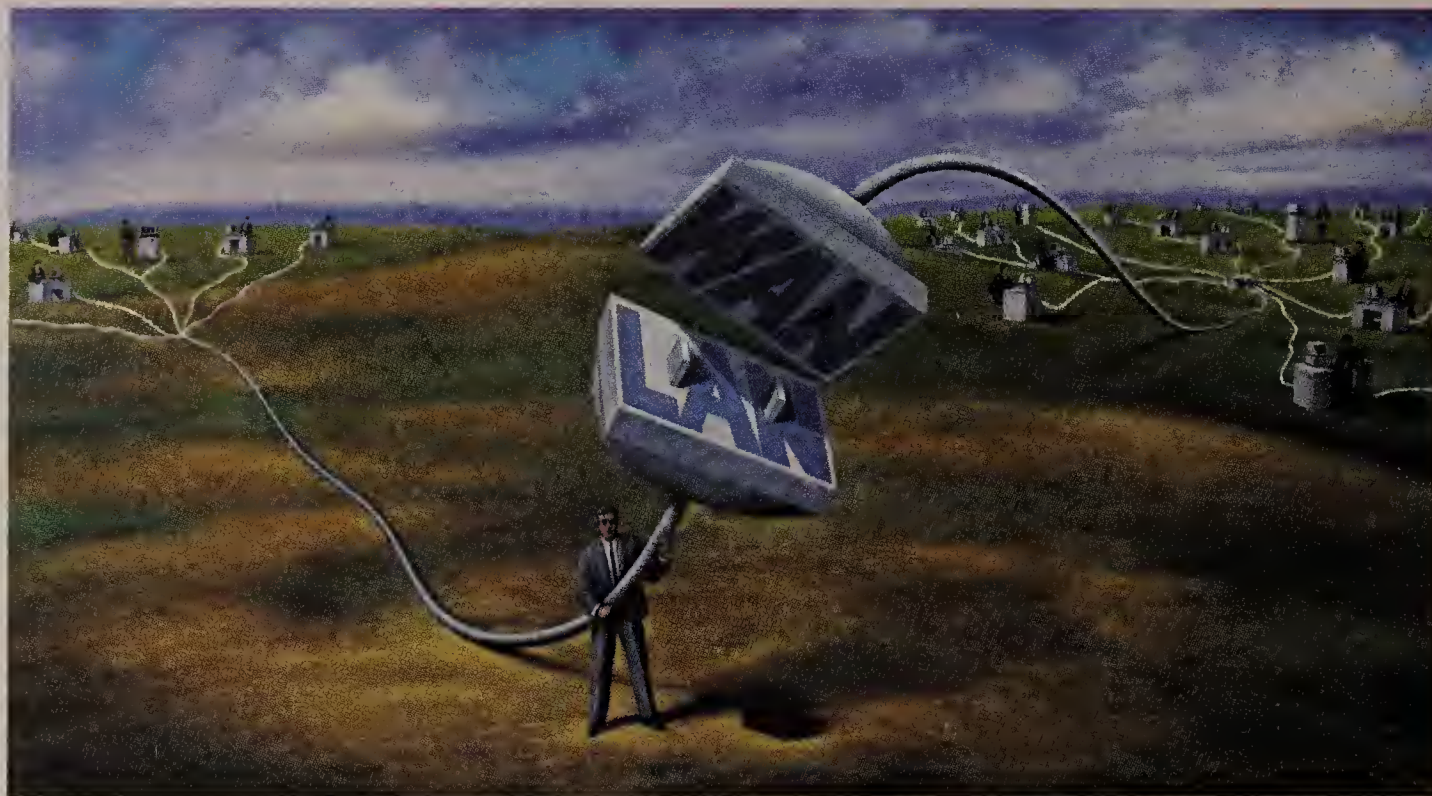
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